REPORT

OF THE

COMMISSIONER OF AGRICULTURE

FOR

THE YEAR 1873.

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CONTENTS.

REPORT

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THE COMMISSIONER OF AGRICULTURE.

DEPARTMENT OF AGRICULTURE,
Washington, D. C., October 26, 1873.

TO THE PRESIDENT:

The progress of events connected with the administration of this Department during the past year has served to exemplify, not only its practical usefulness, but its appreciation by the people, and especially by those who are interested in the pursuits of agriculture. The planters and farmers of the country seem to recognize this Department as a sentinel upon the watch-tower of agricultural interests; to mark whatever new ideas and principles may be developed in the minds of men upon that subject; and to discover and procure such new and useful seeds and plants as may enable them to keep pace with agricultural progress throughout the world.

There is no other duty which devolves upon me so acceptable, so agreeable, and withal so profitable, as the correspondence which I have sought to promote with agricultural colleges, societies, and individuals respecting improvements in the modes of cultivation and experiments in its practical operations. I mean no disparagement of any class of people when I say that the contrast between the character and quality of farming in different portions of our country is most remarkable. Whilst there is a great difference in the natural products of one section from those of another, which requires different modes of culture, yet there are certain fixed principles of the science of agriculture which are common to both, and the neglect of which can never be disregarded with impunity. The planters of our Southern States undertake to cultivate too much land with too little diversity of crop, thereby disabling themselves from obtaining that rotation so essential to successful farming. This undoubtedly grows out of their immediate necessities, the consequences of the late war, from which time only will relieve them. My attention has been strongly attracted to this state of things, and it has given me great satisfaction to sympathize with those who most need the helping hand of this Department of the Government. Whilst the people of the Northern and Middle States, apart from the consideration of the sacrifice of human life, were rather benefited by the war than otherwise, the people of the Southern States were greatly impoverished.

The Western States, now rapidly filling up with a population, many of whom have spent almost the last dollar of their means to reach their place of destination—they, too, have claims upon the consideration of the Government, which, I do not hesitate to say, have been largely administered to by this Department. It is a pleasing task to supply want when it can be done consistently with a proper discharge of duty. And I feel sure that the actions of this Department, as here indicated, will not be found fault with by any portion of a generous people. I may safely say, without the fear of contradiction, that there is no branch of industry in our whole country that is marching forward with so steady and certain a step to improvement as that of agriculture, and it gives me great satisfaction to know that the judicious recognition by Congress of the instrumentality of this Department has enabled me greatly to aid the effort and enterprise which have taken this direction. It is through this influence that the successful experiences or useful discoveries of any part of the world are communicated to our own people, whereby they are enabled immediately to profit.

I have taken great pains to impress upon the southern planters the importance of turning their attention to the cultivation of jute, and in giving them special instructions with regard to its culture, manufacture, and use. By the instrumentality of this Department jute was first introduced into this country from Calcutta, and now its cultivation will probably become one of the established industries of the Southern States. In 1872 there was imported into this country in bales 41,851 tons, costing about $64 per ton in gold at the place of exportation, of which, adding duties, transportation, and exchange, the cost will be more than $4,000,000 for an article of consumption of which a superior quality can be profitably raised in many of the Southern States. Judging from the tone of letters received from parties engaged in the cultivation of this plant, I am assured that it will soon become a profitable industry to an extent now scarcely credible, and this too in a section of our country where diversity of product and certain profit are so desirable. Ramie, another most valuable plant, has been greatly retarded in its production, by the difficulty of separating the fiber; no machinery having been invented which will accomplish this work, although large rewards have been offered by the British government to inventors.

The failure of Congress at its last session to provide for the publication of the annual report has subjected the Department to great inconvenience. There are from one to four agents in every county of every State who monthly report the acreage, condition of the crop, and final result, which, when aggregated, tabulated, and published monthly, afford such information as keeps the subject of agricultural products out of the hands of speculators, and thereby protects the interests of producers. The only compensation which can be given for this most useful work is that we can supply such agents with our annual and monthly publications, and seeds for distribution to the farmers around them. This, as

to the annual report, we have not been enabled to do. There is no work published in this country for which there is so great a demand as the annual report of this Department. The farmers of the country have been so long accustomed to receive it that they cannot understand why there should be any intermission in its publication. The Senate, in their extra session, ordered twelve hundred copies to be printed for their use, which necessarily involved the composition and stereotyping of the work, leaving little expense to be incurred in supplying the usual number of copies for general distribution, which I trust that Congress when it meets may immediately order.

The Department is in the daily receipt of information from its agents and others with regard to the results from superior seeds and plants which have been distributed; from which it is very certain that, in wheat and oats alone, the increased production of each amounts to many millions of bushels. Farmers have been convinced of this; hence it has been the pleasure of Congress from time to time for several years to increase the appropriation for the seed department. I take this occasion to suggest that the work of this division should not be done in the building occupied by the Department. If a house were built for this purpose, it might be so constructed as, in a great measure, to exclude vermin, which infest the rooms now occupied. Such a building might be constructed for ten thousand dollars, the appropriation of which I recommend.

The following tabular statement will show the quantity and kind of seeds distributed by the seed division from the 1st July, 1872, to the 30th June, 1873:

Name of seed.	Varieties.	Senators and Members of Congress.	Agricultural societies.	Statistical correspondents.	Meteorological observers.	Miscellaneous applicants.	Totals.
Vegetable .... papers..	244	138, 103	119, 350	79, 330	10, 620	270, 161	617, 564
Flower .... do....	189	60, 965	4, 225	140	7, 140	154, 826	227, 296
Herbs .... do....	12	....	60	....	....	211	271
Tree and evergreen .... do....	74	30	32	179	....	3, 631	3, 872
FIELD SEEDS.							
Wheat .... quarts..	10	14, 317	24, 824	13, 975	....	10, 242	63, 358
Oats .... do....	4	20, 214	15, 488	6, 210	....	4, 298	46, 210
Barley .... do....	2	186	7, 406	1, 430	....	602	9, 624
Rye .... do....	2	....	2, 172	5, 976	....	829	8, 977
Buckwheat .... do....	2	1, 778	50	6, 328	....	314	8, 476
Corn .... do....	2	896	4, 646	5, 989	....	1, 520	13, 051
Pease .... do....	1	553	176	2, 338	....	339	3, 406
Grass .... do....	7	2, 330	4, 540	5, 837	....	2, 409	15, 116
Clover .... do....	4	42	106	2	....	1, 316	1, 466
Sugar-beet .... do....	2	91	1, 727	214	....	248	2, 076
Mangel-wurzel .... do....	4	96	1, 365	....	....	164	1, 839

Name of seeds.	Varieties.	Senators and Members of Congress.	Agricultural societies.	Statistical correspondents.	Meteorological observers.	Miscellaneous applicants.	Totals.
Rice .... quarts..	2	....	4	....	....	44	48
Sorghum .... do....	2	12	42	....	....	189	243
Broom-corn .... do....	1	....	....	....	....	29	29
Sunflower .... do....	2	....	....	....	....	38	38
Vetches or tares .... do....	1	....	....	....	....	6	6
Tobacco .... papers..	4	20, 466	1, 120	....	....	2, 959	24, 545
Osage orange .... do....	1	....	....	....	....	139	139
Tea-seeds .... do....	1	16	30	....	....	145	191
Opium-poppy .... do....	1	40	....	....	....	461	501
Millet .... quarts..	1	8	....	....	....	24	32
TEXTILES.							
Cotton .... quarts..	......	52	26	1, 034	....	362	1, 474
Jute .... papers..	......	340	40	32	....	338	750
Ramie .... do..	......	....	....	....	....	255	255
Hemp .... tons..	......	24	4	....	....	5	33
Total amounts	......	260, 559	187, 449	129, 014	17, 760	456, 104	1, 050, 886

I took occasion in my last annual report to note how admirably adapted and judiciously associated were the component parts of the Department to promote and care for the agricultural and horticultural interests of the country. Longer experience confirms this opinion.

The division of horticulture, pomology, and arboriculture is necessarily a very important one; the introduction and extension of utilizable plants, valuable for their commercial products, the testing of fruits and intelligent advisory dissemination of the various kinds of fruit-plants, are operations oftentimes slow in their fulfillment, as they are tardy in development, but valuable when completed. Years may elapse between the procuring of a plant and its final disposition. Fiber-plants and those of like character, whose ultimate value depends upon perfected chemical and mechanical manipulations, should not be too hastily laid aside.

In the Southern States, where many semi-tropical products may be cultivated, a great desire is being manifested to experiment with various crops not hitherto successfully cultivated there; this desire increases as a knowledge of the benefits of diversified culture extends. Such is the interest taken in this subject, that I have been repeatedly requested to recommend the establishment of stations or farms at different localities throughout the country, for the purpose, among other objects, of acclimating seeds and plants of tropical and semi-tropical kinds; to which I have always replied that I cannot acquiesce in the propriety of such a proposition, for, apart from the vast immediate expense which such establishments would require, and the host of officers and employés that it would necessitate, I have great doubt whether any profitable result

would be attained. Whilst the human system may, to some extent, be acclimated to the endurance of heat and cold, and perhaps to resist causes of disease, it is very questionable whether any plant can be acclimated to any useful purpose out of its native element.

The improvements in the grounds of the Department, especially those of a permanent character, are being completed as rapidly as means allow. The planting of the arboretum proceeds slowly on account of the difficulty of procuring the rare species and varieties to which the wants of the collection are now reduced.

The arrangement and improvement of some of the streets of Washington have so affected the character of the lot heretofore used as a propagating garden, which lies between Four-and-a-half and Sixth streets, as to render it entirely useless for the purposes of this Department; it has, therefore, been abandoned, and plants, such as can be removed, have been transferred to the Department grounds and buildings prepared for them there.

The filling up of the canal and construction of a street upon part of its location has thrown out a strip of ground, about four acres, along the north side of the Department ground, which by an arrangement with the Commissioner of Public Buildings and Grounds, has been exchanged for the lot above referred to, and will be properly inclosed.

The importance of the entomological division is daily becoming more important. An illustration of the injuries done by insects to the farmers and planters will be found in the statement by the statistician of the Department, who estimates the loss of cotton by worms, the present season, at half a million of bales, which, at $75 per bale, represents a loss of $37,500,000. A loss of ten per cent. of the wheat-crop by the depredation of insects, which cannot be deemed an extravagant assumption, means this year a loss of twenty-five million of bushels, worth as many dollars. These data lead necessarily to the conclusion that the observations and study of the entomologist constitute an important branch of agricultural knowledge. Some insects, as the western potato-beetle, and others, have already been extensively destroyed, and the crops saved, by the use of Paris green and flour, and experiments are now being made to test its efficacy in destroying the much-dreaded cotton caterpiller. A circular has been issued to ascertain how much has been accomplished in this direction during the present season, and as soon as answers shall have been received, the facts will be published in the reports.

During the past year an additional room has been fitted up, which will be devoted to an exhibition of economic entomology, and adapted to the rapidly increasing collection of beneficial and injurious insects, and arranged to illustrate some of the most prominent vegetable products and their enemies, giving at a glance all the injurious species preying upon each product, in their different stages. Here will be shown, too, the architecture of insects; their cases, nests, galls, cocoons, and

specimens showing how all kinds of vegetable and animal substances are injured, eaten, mined, or otherwise destroyed by insects, so that the farmer may at once recognize them by their work. All of which will be classified according to the latest and best systems, and identified by their names, localities, &c., making the whole of great practical value to the student of entomology.

During the past year the work of the botanical division has been energetically prosecuted. The collections of several of the Government exploring expeditions have been received, as well as some from private individuals. Over 5,000 specimens have been added to the herbarium. Packages comprising several thousand specimens have been prepared and forwarded to men of science in Switzerland, Germany, Austria, and to the Imperial Herbarium of St. Petersburg; and many packages of duplicates are ready for distribution to scientific societies of our own country.

I respectfully suggest that this division should embrace a full collection of sections, of convenient size, of all the forest trees of our country, so arranged as to exhibit their natural character of bark, with longitudinal sections showing the appearance of the wood and its adaptation to purposes of economy in the arts—as, for building or cabinet work—each accurately named and accompanied with specimens of its fruit and leaves. Such a collection would have an especial value, as presenting, comprehensively, the richness of our country in the variety and qualities of our forest vegetation, and would offer a rare opportunity to students and men of science for instruction in this department of knowledge. And in connection with this subject I suggest that the approaching Centennial Exposition affords an additional argument for the preparation of such a collection of our forest specimens. Such a work will not be done by any private individual, and it seems to be peculiarly fit that this feature of our great country should be shown through the medium of this Department. This would require an appropriation by Congress not exceeding two thousand dollars.

An individual in Aiken, S. C., well known for his researches in fungi and the lower order of vegetation, is possessed of a large and valuable collection of specimens, the result of thirty years' accumulation, which he proposes to sell for one thousand dollars. It occurs to me that the opportunity of securing so valuable a collection should not be neglected, when it is considered that this field of study is so abstruse, and has been so little prosecuted, and that there are in the country so very few reliable and authentic collections.

The operations of the statistical division are, year by year, becoming more accurate and comprehensive. The crop-reporting system, though an unpaid service, is more efficient and reliable than any other means employed to ascertain the condition of growing crops. It is similar to that employed by associations and trade-boards, except that it is more extensive, regular, and prompt in communication, more systematic and

thorough in detail, and more intelligent and practical in the material of its returns. There are now sixteen hundred counties, which include nearly all of much importance in production, represented each by a principal correspondent and board of assistants, selected from the most intelligent and public-spirited farmers. The work of the statistical division includes also the entire range of agricultural statistics, and embodies and epitomizes the facts of American agriculture, as created by systematic experiment, current practice, the work of agricultural organizations, and the movement of intercontinental and export trade. Nor does it neglect altogether the experience and practice of foreign countries, the extent of their production, and range of prices. Still more attention will be given to this field which has such intimate relation to our own agricultural prosperity, in affording a market for our surplus products, and in furnishing suggestions of economy and skill in practice and diversity and profitable extension in production. To this desirable end the statistician was sent to Europe the past summer to perfect exchanges, to establish relations of statistical reciprocity, investigate statistical methods, and thus increase and perfect the resources of the statistical division in this direction. The importance of foreign agricultural statistics is indicated by the constantly increasing value of our agricultural exports, which, in the fiscal year of 1872, amounted to the magnificent sum of $406,394,254, including $1,773,716 for living animals; $75,287,133 for animal products; $84,751,688 for breadstuffs; $182,988,835 for cotton and cotton products; $15,240,872 for wool in its various forms, and $46,352,010 for oils, vegetables, tobacco, and miscellaneous products of agriculture, either raw or manufactured.

There has been an increase of upwards of four hundred volumes to the library of the Department the past year. Of this increase, about two hundred volumes have been presented by the authors and by foreign agricultural and scientific associations, and from State boards of agriculture. The aggregate number of volumes is about 6,000.

We continue to receive transactions of all the leading agricultural societies of England, France, Germany, and Italy, as well as from several governments in Central and South America. To the courtesy of the Canadian government we are indebted for full reports on the agriculture, fisheries, public works, statistics, &c., of the Dominion. The library contains nearly complete sets of the transactions of the boards of agriculture of the leading States for the last twenty years. The boards of trade of the chief cities of the Union have presented complete sets of their reports. All the associations referred to continue to forward their current volumes as fast as published.

In all the standard works on agriculture and its cognate branches of botany, geology, chemistry, and entomology, the library is now undoubtedly the most complete, in this country at least. It is in constant use by the clerks of the Department, and in fact is indispensable for reference in conducting its large correspondence.

Of the numerous pamphlets presented to the library, those possessing permanent interest or value are classified and bound together; such as, the reports of the dairymen's associations, and those of the State commissioners on the fisheries; those of a more miscellaneous nature are bound, those of each State by themselves, and lettered with the name of the State to which they refer.

The librarian is now engaged in the preparation of a catalogue of the library. This is a task which requires much time, labor, and knowledge. The full title of each book will be copied under the author's name; then a classification of subjects, and a cross-reference, comprising a short abstract, (generally in one line,) of the titles of all the books in the library referring to any particular subject. The great assistance of this arrangement to those engaged in the investigations and correspondence of the Department is obvious.

The shelving on the west side of the room, completed last year, is already nearly filled by the steady increase of the library. An appropriation of $500 was made last winter to carry the shelving and gallery across the south end; but this sum may be insufficient for the purpose. As this additional space will be indispensable, in the course of a year or two, for the natural increase of the library, I therefore respectfully suggest that an additional appropriation of $500 be made. This improvement would also add to the beauty and symmetrical appearance of the room, already so attractive as to be constantly noticed by visitors.

Among the most important additions to the library the past year, are "Sowerby's English Botany," in 11 volumes, comprising colored figures and descriptions of all the plants grown in Great Britain, and the "Flora Française," a similar work on the plants of France. These, and other works of a scientific character, are very expensive; and to purchase them and the various scientific periodicals of Europe and America, so as to keep abreast with the rapid progress of modern science, renders necessary the usual appropriation by Congress for the increase of the library.

The microscopic division of this Department was established a little more than a year ago, and has for its objects the investigation of all subjects relating to agriculture which require more minute observations in their examinations than can be made with the naked eye, whether they belong to the animal, vegetable, or mineral kingdom. Numerous letters of inquiry upon subjects of the character here referred to, had been received from time to time, by the Department, the responses to which had long urged the necessity of such a division. Thus far the microscopist has made some investigations into the organic structure and the mode of growth of plants, but his attention has been chiefly directed to their diseases, and especially to those which are supposed to originate from a class of very minute organisms called parasitic fungi, several thousand species of which are, as individuals, invisible to the naked eye, and appear as mere pigments of different colors scattered

over the surface of the plants on which they grow, and from which they draw their nourishment. Under the power of the microscope these minute parasitic plants are beautifully revealed, so that their organs and mode of growth can be accurately studied. In the choice of subjects for investigation, the microscopist has been influenced principally by letters received from agriculturists in different sections of the country, who are desirous of ascertaining the causes and remedies of those diseases which are laying waste their crops, and rendering their labors valueless. Potato-rot, peach-yellows, onion-rust, pear-blight, orange-blight, and other diseases have been thoroughly studied, and their peculiarities noted. Careful observations have been made on the habits of several species of fungi, inhabiting the different plants, and accurate drawings of them, at different stages of their growth, have been made. All these have been published at various times in our reports. It is believed that a considerable number of new facts have been developed, and a way opened by which those diseases, in some of their forms, may be more philosophically and successfully treated, and their ravages in some degree counteracted. These investigations will be continued in future with increased energy, with the assurance that if but a single effectual remedy can be discovered which will stay the progress of any one of the diseases named, the advantages accruing to the agriculturist will exceed a thousand-fold the expense incurred in their investigation.

The total amount appropriated to this Department for the fiscal year ending June 30, 1873, was $202,440. Of this amount I have expended $198,046.73, under the following heads of appropriations, viz:

Salaries	$75,889 73
Collecting statistics	14,442 33
Purchase, &c., of seeds and plants	55,000 00
Museum	3,903 90
Furniture, cases, and repair	3,908 13
Library	1,750 00
Laboratory	700 00
Experimental garden	10,000 00
Contingent expenses	11,452 64
Improvement of grounds	21,000 00
Total	$198,046 73

Leaving an unexpended balance of $4,393.27, which will be ample to pay all unsettled bills incurred by this Department during the fiscal year ending June 30, 1873.

The amount appropriated for the current fiscal year is $257,730, (exclusive of $20,000 for printing, which is drawn directly from the United States Treasury, by the Public Printer, and a re-appropriation of $2,180.92, to pay an unsettled account against the Department incurred in 1871.) Of this amount I have expended $51,040.06, under the following heads of appropriations, viz:

Salaries	$12,826 00
Collecting statistics	1,831 45
Purchase, &c., of seeds and plants	7,916 46
Museum	408 75
Library	117 41
Laboratory	370 41
Experimental garden	1,288 50
Contingent expenses	2,633 73
Improvement of grounds	2,917 35
Postage	20,730 00
Total	$51,040 06

Leaving an unexpended balance of the appropriation for the current fiscal year of $206,689.94, which I deem sufficient for the legitimate operations of this Department.

The estimates for the next fiscal year were transmitted to the honorable Secretary of the Treasury, in accordance with law; they were made with due regard to economy, and are indispensable to the efficiency of the Department.

I have the honor to be, most respectfully, your obedient servant,

FRED'K WATTS,

Commissioner of Agriculture.

REPORT OF THE STATISTICIAN.

SIR: I have the honor to present my ninth annual report as statistician of the Department of Agriculture. While the crop-reporting system in operation in the statistical division has been growing in completeness and efficiency, stimulating State and district efforts by similar voluntary agency in different parts of the country, and gradually educating the people to the importance and necessity of accuracy in statistical returns, it should be remembered that this means of statistical collection is but one of the functions of this branch of the Department service. The gathering of the official records of the census, of State assessors, of boards of trade and industrial organizations, and the results of individual experiment and investigation, requires constant labor and research; and the official statistics of foreign governments, societies, and technical schools, and the labors of eminent professors of applied science, demand equal activity and assiduity. No portion of the domain of social science, no section of the range of political economy, can fail to reveal facts of value to the ruralist in the practice of his many arts based on many sciences.

Since the report of 1872 was presented I have spent a few months in Europe for the purpose of investigating more thoroughly the statistical methods of the principal governments, of making arrangements for valuable exchanges, and of obtaining a nearer and clearer view of the facts of European agriculture, especially such as may be applicable to the conditions affecting rural advancement in this country.

The government offices of London, Paris, Berlin, and Vienna were visited, and every facility was courteously furnished for investigation of their statistical methods and their operations in aid of agriculture. The official representatives of the United States at these seats of government promptly rendered all desired aid in procuring facilities for such investigation. There is a great diversity of organization, scope, and action of the agricultural departments of these governments. Some are connected with other branches of administration, and others are invested with the dignity of full departments. An increasing importance is of late accorded to them, and they are eminently becoming more efficient and useful. They are generally organized upon a foundation of less breadth than that of our own, but pursue investigation with greater tenacity and thoroughness, and are enabled to do so by more liberal appropriations of money, thereby rendering their special reports of greater value. Their annual reports are of less interest, and do not appear to have a very extended circulation. An exposition of the main features of these organizations, and of the facts which they present, will be more fully presented in issues from time to time of the monthly and annual reports.

In the present report will be found more than the usual amount of condensed tabular statement, designed to supplement the primitive and fragmentary presentation of fact so common in statistical reports, and to save the statistical student much of his labor of analysis and deduction. It has been thought especially desirable to give important statements as much of continuity and completeness as possible, to increase their value for reference, and to enhance their labor-saving power in the work of investigation.

THE CROPS OF 1873.

CORN.—Owing to wet weather in spring, the planting was universally late. Throughout the Eastern, Middle, and Northwestern States the failure in germination was very general. This is partially accounted for on the supposition that the seed-corn, not sufficiently ripened in the autumn, was injured by the severity of winter-freezing. Poor seed, heavy rains, a cold spring, and the depredations of worms occasioned an almost unprecedented amount of replanting, often the second, and in not a few cases the third, and even the fourth time. Many counties in the latitude of Missouri and Southern Illinois, reported much of the projected area of the crops unplanted on the 1st of June. In the Pacific States, and in those east of Indiana, an early drought checked growth, while in the Mississippi Valley and throughout the South protracted wet weather hindered cultivation and multiplied weeds and grass. These combined causes left the crop in a backward and unfavorable condition, when a change for the better occurred, and the months of July and August, the corn-making season, were more propitious. Still the losses of the early summer could not be wholly repaired, and the chinch-bug levied heavy contributions in portions of the great corn-growing region, while grasshoppers proved destructive in sections of Wisconsin, Iowa, and Kansas. The tables show substantially the result, as their figures are verified by the crop movement of the year.

WHEAT.—The wheat-crop, during every stage of growth, was in advance of that of 1872. The improvement in winter-wheat was quite marked in the Middle States, in Ohio, and Michigan, and in Kansas. In Indiana and Illinois drought retarded seeding and germination, leaving the plants too weak and shallow-rooted to endure well the winter's changes of temperature. In the South the crop was less promising throughout the season than in 1872. The indications of April were fulfilled in the later record, as to the fall-sown area, except that prospects gradually brightened towards the harvest in Indiana and Illinois. The spring-wheat crop was remarkably fine in all its stages, yielding returns rarely exceeded, and making the aggregate product of this cereal greater, with the exception of that of 1869, than in any year of the past decade.

OATS.—An increase of 7 per cent. in area of oats is estimated. Early in the season the crop prospect was more than usually good; during the month of June there was a decline in condition in most of the States north of the fortieth parallel, and in Maryland and Virginia; in the Southern States they were generally harvested early in the month. The liability to rust in oats in southern latitudes is so great that extreme care is exercised to obtain kinds found to be most reliable in this respect. There is a variety known as the "red," or "rust-proof oats," very widely sown, and claimed to have successfully resisted rust for twenty years in one locality. The result was a yield somewhat diminished in the aggregate, generally full in the South; and in the North, very generous in Vermont, Minnesota, and Oregon.

HAY.—There appears to be a tendency to enlarge the area of clover, nearly all the States reporting increased breadth in 1873. It is found that in all clay soils, or those with a clay subsoil, in the South there is little difficulty in getting a good growth of clover. Cultivators there are changing their opinions on this point, as they see the results of experiment and learn the conditions of success. Severe droughts or intense heat upon light soils are trying to the plant before it is fairly

rooted, as in the sands of New Jersey in 1872, where much of the young clover was killed by the severity of the drought of that year. Drought in June reduced the condition of all grasses in the Eastern and Middle States, and in Ohio, Michigan, and California. Later, in the latter part of June and in July, refreshing rains greatly revived the sections suffering from drought and greatly increased the prospect for a hay-crop. The average rate of yield, as ultimately estimated, was nearly as large as in 1872 for the entire country.

COTTON.—The tendency to increase in area of cotton has been strong for several years, checked only by the recurrence of low prices when large yields have been obtained. In 1873 the increase, estimated at about 10 per cent., was evidently not overrated. The controlling influence of the cotton mania is about equal with the mere laborer and the land proprietor, and appears to be little weakened by the repeated expression of the deliberate judgment of all intelligent men who see the inexpressible folly of enlarging this culture to the neglect of everything else. While acknowledging the error, and counseling reduction of area, many planters will quietly enlarge their own breadth of cotton to reap the benefit of a presumed decrease in the aggregate, and thus tend to keep up production to its highest point. This selfishness of producers defeats its own aims. The selfishness of consumers is equally intense, caring nothing for the building up of a great section, and only desirous of cheap cotton at any cost of deprivation, poverty, and industrial helplessness of its growers. The question at issue is not one of mere quantity of cotton grown; it is one of growing cotton exclusively—the pursuit of one idea in industry—the attempt of a people of nine or ten millions to live on $30 *per capita* received for cotton, with which to buy bread and meat, butter and cheese, horses and mules. The folly that is fought is that of spending the entire summer in killing grass, and burdening the railroads in the winter with freights of hay from the West; of sitting in the shade of a hickory tree waiting for ax-helves to be brought from the North; of forfeiting title to mountains of iron by refusal to pay nominal taxes, while complaining of the tariff on the metal of which plows and hoes are fabricated. If half the area of grass that is punished so vigorously in cotton-fields were allowed to grow, it would shade the soil and preserve for use its stores of fertility, feed domestic animals, save millions spent in commercial fertilizers, furnish a restorative rotation, and soon enable the remaining half of the present cotton-fields to produce a full supply of cotton at half the present cost. This is what is meant by counsels to planters to abandon the present system; it furnishes the only escape from continued dependence and comparative poverty; and it is the duty of this Department continually to urge it in utter disregard of the selfish but mistaken ideas of speculators or consumers, who are too short-sighted to see that it furnishes the only hope for permanently abundant and regular supplies of cotton. Speculators do not desire this abundance and regularity; all honest manufacturers do desire both.

The spring of 1873 was not deemed favorable for a heavy crop. April was a cold month; much seed rotted in the ground. May was very wet, preventing work, for which the growing grasses (weeds) created an increased demand. Our returns made the crop at least two weeks later than usual. The State averages of comparative condition in June ranged from 85 in North Carolina to 102 in Florida. In July the general average of condition, compared with a full crop, (which is rarely if ever realized, so many are the drawbacks,) was about 90. In September the only causes of deterioration were rains and worms, "the former no more

destructive than severe droughts of former years, the latter less so than in some former visitations." Rains in June were more general, and far heavier than usual. There was more in July than in that month of the previous year, from North Carolina to Mississippi; and in August, in some locations, there was too much moisture for the highest good of the crop. As compared with returns of condition in 1872, those of September were higher in Arkansas and Tennessee, and lower in the remaining States; the average of the whole being somewhat lower. The season for maturing and picking was quite favorable, and the result of the cotton movement reveals a crop not quite so heavy as that of 1872, in proportion to acreage, thus verifying the close accuracy of all reports of condition up to October, while the returns of probable yield in that month were too low, as is apt to be the case in local estimates of total quantity in harvest time.

OTHER CROPS.—For details of other crops reference is made to the following table of estimates, affording opportunity for local comparison with former estimates:

Table showing the product of each principal crop of the several States named, the yield per acre, the total acreage, the average price in each State, and the value of each crop for 1873.

Products.	Quantity produced in 1873.	Average yield per acre.	Number of acres in each crop.	Value per bushel, pound or ton.	Total valuation.
MAINE.					
Indian corn....bushels.	852, 000	24	35, 500	$0 91	$775, 320
Wheat....do....	219, 000	11	19, 909	1 90	416, 100
Rye....do....	26, 000	14. 5	1, 793	1 15	29, 900
Oats....do....	1, 305, 000	21	62, 143	58	756, 900
Barley....do....	410, 000	16. 7	24, 551	91	373, 100
Buckwheat....do....	371, 000	17. 4	21, 322	72	267, 120
Potatoes....do....	2, 997, 000	117	25, 615	52	1, 558, 440
Tobacco....pounds.	....	....	....	....	....
Hay....tons.	1, 204, 200	. 93	1, 294, 839	12 20	14, 691, 240
Total....	....	....	1, 485, 672	....	18, 868, 120
NEW HAMPSHIRE.					
Indian corn....bushels.	1, 305, 000	37. 5	34, 800	92	1, 200, 600
Wheat....do....	169, 000	15	11, 267	1 88	317, 720
Rye....do....	40, 000	17. 2	2, 325	1 10	44, 000
Oats....do....	1, 003, 000	36	27, 861	55	551, 650
Barley....do....	77, 000	20	3, 850	1 00	77, 000
Buckwheat....do....	77, 000	18. 7	4, 117	75	57, 750
Potatoes....do....	3, 191, 000	150	21, 372	48	1, 531, 680
Tobacco....pounds.	450, 000	1, 285	350	15	67, 500
Hay....tons.	723, 800	1. 05	689, 333	15 00	10, 857, 000
Total....	....	....	795, 176	....	14, 704, 900
VERMONT.					
Indian corn....bushels.	1, 748, 000	31	56, 387	85	1, 485, 800
Wheat....do....	399, 000	16	24, 937	1 67	666, 330
Rye....do....	60, 000	16. 1	3, 727	95	57, 000
Oats....do....	3, 579, 000	32. 6	109, 785	49	1, 753, 710
Barley....do....	97, 000	23. 8	4, 075	86	83, 420
Buckwheat....do....	365, 000	20. 5	17, 805	72	262, 800
Potatoes....do....	5, 088, 000	140	36, 343	44	2, 238, 720
Tobacco....pounds.	350, 000	1, 272	275	20	70, 000
Hay....tons.	893, 200	1. 10	812, 000	13 38	11, 951, 016
Total....	....	....	1, 065, 334	....	18, 568, 796

Table showing the product of each principal crop, &c.—Continued.

Products.	Quantity produced in 1873.	Average yield per acre.	Number of acres in each crop.	Value per bushel, pound, or ton.	Total valuation.
MASSACHUSETTS.					
Indian corn .... bushels.	1, 446, 000	35	41, 314	84	1, 214, 640
Wheat .... do....	31, 000	19	1, 631	1 66	51, 460
Rye .... do....	246, 000	17	14, 470	1 04	255, 840
Oats .... do....	665, 000	33. 3	19, 970	59	392, 350
Barley .... do....	110, 000	22	5, 000	1 03	113, 300
Buckwheat .... do....	50, 000	15. 6	3, 205	86	43, 000
Potatoes .... do....	2, 425, 000	125	19, 400	70	1, 697, 500
Tobacco .... pounds.	8, 200, 000	1, 459	5, 620	17	1, 394, 000
Hay .... tons.	409, 200	1. 04	393, 461	25 10	10, 270, 920
Total	....	....	504, 071	....	15, 433, 010
RHODE ISLAND.					
Indian corn .... bushels.	297, 000	28. 7	10, 348	92	273, 240
Wheat .... do....	....	....	....	....	....
Rye .... do....	20, 000	16. 2	1, 234	97	19, 400
Oats .... do....	150, 000	31. 3	4, 792	61	91, 500
Barley .... do....	32, 500	25. 5	1, 274	1 15	37, 375
Buckwheat .... do....	....	....	....	....	....
Potatoes .... do....	550, 000	96	5, 729	81	445, 500
Tobacco .... pounds.	....	....	....	....	....
Hay .... tons.	76, 500	. 95	80, 526	27 50	2, 103, 750
Total	....	....	103, 903	....	2, 970, 765
CONNECTICUT.					
Indian corn .... bushels.	1, 534, 000	30	51, 133	94	1, 441, 960
Wheat .... do....	39, 700	18	2, 205	1 65	65, 505
Rye .... do....	323, 000	16	20, 187	1 06	342, 380
Oats .... do....	956, 000	32	29, 875	60	573, 600
Barley .... do....	23, 000	23. 5	979	1 10	25, 300
Buckwheat .... do....	104, 000	18. 2	5, 714	98	101, 920
Potatoes .... do....	2, 273, 000	97	23, 433	83	1, 886, 590
Tobacco .... pounds.	8, 600, 000	1, 647	5, 220	23	1, 978, 000
Hay .... tons.	512, 600	1. 09	470, 275	25 00	12, 815, 000
Total	....	....	609, 021	....	19, 230, 255
NEW YORK.					
Indian corn .... bushels.	17, 692, 000	31	570, 710	70	12, 384, 400
Wheat .... do....	7, 047, 000	13. 5	522, 000	1 60	11, 275, 200
Rye .... do....	1, 853, 000	14	132, 357	86	1, 593, 580
Oats .... do....	27, 548, 000	31	888, 645	43	11, 845, 640
Barley .... do....	5, 876, 000	21. 2	277, 170	1 10	6, 463, 600
Buckwheat .... do....	2, 947, 000	19. 7	149, 594	77	2, 269, 190
Potatoes .... do....	24, 925, 000	103	241, 990	54	13, 459, 500
Tobacco .... pounds.	2, 950, 000	1, 000	2, 950	11	324, 500
Hay .... tons.	4, 199, 800	1. 02	4, 117, 451	18 00	75, 596, 400
Total	....	....	6, 902, 867	....	135, 212, 010
NEW JERSEY.					
Indian corn .... bushels.	10, 442, 000	36	290, 055	62	6, 474, 040
Wheat .... do....	1, 948, 000	16. 2	120, 247	1 65	3, 214, 200
Rye .... do....	485, 000	14. 1	34, 397	85	412, 250
Oats .... do....	2, 737, 000	26. 5	103, 283	49	1, 341, 130
Barley .... do....	7, 200	24	300	1 10	7, 920
Buckwheat .... do....	288, 000	16. 5	17, 454	96	276, 480
Potatoes .... do....	3, 560, 000	90	39, 555	67	2, 385, 200
Tobacco .... pounds.	....	....	....	....	....
Hay .... tons.	416, 300	1. 03	404, 175	24 50	10, 199, 350
Total	....	....	1, 009, 466	....	24, 310, 570
PENNSYLVANIA.					
Indian corn .... bushels.	36, 929, 000	35. 1	1, 052, 108	60	22, 157, 400
Wheat .... do....	15, 548, 000	14. 2	1, 094, 929	1 50	23, 322, 000
Rye .... do....	3, 283, 000	14. 5	226, 414	81	2, 659, 230
Oats .... do....	31, 229, 000	30. 2	1, 034, 073	43	13, 428, 470
Barley .... do....	398, 000	20. 6	19, 320	1 05	417, 900
Buckwheat .... do....	2, 022, 000	19. 5	103, 692	84	1, 698, 480
Potatoes .... do....	10, 602, 000	96	110, 437	65	6, 891, 300
Tobacco .... pounds.	15, 000, 000	1, 186	12, 640	12. 3	1, 845, 000
Hay .... tons.	2, 446, 400	1. 15	2, 127, 304	17 80	43, 545, 920
Total	....	....	5, 780, 917	....	115, 965, 700

Table showing the product of each principal crop, &c.—Continued.

Products.	Quantity produced in 1873.	Average yield per acre.	Number of acres in each crop.	Value per bushel, pound, or ton.	Total valuation.
DELAWARE.					
Indian corn....bushels.	2,960,000	19	155,789	53	1,568,800
Wheat....do....	588,000	11	53,454	1 68	987,840
Rye....do....	11,000	11	1,000	87	9,570
Oats....do....	397,000	19.3	20,570	46	182,620
Barley....do....	1,800	17	106	90	1,620
Buckwheat....do....	1,200	23	52	70	840
Potatoes....do....	222,000	97	2,288	78	173,160
Tobacco....pounds.	....	....	....	....	....
Hay....tons.	31,000	.81	38,271	26 00	806,000
Total....	....	....	271,530	....	3,730,450
MARYLAND.					
Indian corn....bushels.	10,451,000	21.4	488,364	68	7,106,680
Wheat....do....	5,262,000	11.3	465,664	1 54	8,103,480
Rye....do....	309,000	12.5	24,720	80	247,200
Oats....do....	2,798,000	18.8	148,830	44	1,231,120
Barley....do....	10,600	18	589	85	9,010
Buckwheat....do....	60,000	17	3,529	75	45,000
Potatoes....do....	1,336,000	80	16,700	70	935,200
Tobacco....pounds.	19,300,000	877	22,000	07.7	1,486,100
Hay....tons.	169,400	1	169,400	19 00	3,218,600
Total....	....	....	1,339,796	....	22,382,390
VIRGINIA.					
Indian corn....bushels.	19,275,000	19	1,014,474	59	11,372,250
Wheat....do....	5,788,000	7.5	771,733	1 45	8,392,600
Rye....do....	465,000	9.7	47,938	78	362,700
Oats....do....	5,397,000	16.3	331,104	44	2,374,680
Barley....do....	7,000	18.5	378	70	4,900
Buckwheat....do....	40,000	17.9	2,234	70	28,000
Potatoes....do....	1,242,000	70	17,743	71	881,820
Tobacco....pounds.	50,000,000	608	82,200	09.2	4,600,000
Hay....tons.	160,000	1	160,000	17 20	2,752,000
Total....	....	....	2,427,804	....	30,768,950
NORTH CAROLINA.					
Indian corn....bushels.	21,130,000	14.2	1,488,028	64	13,523,200
Wheat....do....	2,795,000	6.2	450,806	1 55	4,332,250
Rye....do....	307,000	8.1	37,901	85	260,950
Oats....do....	3,146,000	16.3	193,006	56	1,761,760
Barley....do....	3,200	16.6	193	66	2,112
Buckwheat....do....	19,500	16.6	1,175	65	12,675
Potatoes....do....	780,000	94	8,298	69	538,200
Tobacco....pounds.	14,500,000	591	24,500	09	1,305,000
Hay....tons.	94,500	1.20	78,750	13 00	1,228,500
Total....	....	....	2,282,657	....	22,964,647
SOUTH CAROLINA.					
Indian corn....bushels.	9,245,000	9.5	973,158	94	8,690,300
Wheat....do....	522,000	5.5	94,909	2 25	1,174,500
Rye....do....	45,000	7	6,428	1 60	72,000
Oats....do....	617,000	14	44,071	85	524,450
Barley....do....	6,300	20	315	2 00	12,600
Buckwheat....do....	....	....	....	....	....
Potatoes....do....	75,000	70	1,071	1 10	82,500
Tobacco....pounds.	60,000	545	110	10	6,000
Hay....tons.	22,400	1.10	20,363	27 00	604,800
Total....	....	....	1,140,425	....	11,167,150
GEORGIA.					
Indian corn....bushels.	24,014,000	12.3	1,952,358	82	19,691,480
Wheat....do....	2,176,000	7	310,857	1 75	3,808,000
Rye....do....	110,000	6	18,333	1 64	180,400
Oats....do....	4,800,000	13.4	358,209	75	3,600,000
Barley....do....	8,900	13.2	674	1 20	10,680
Buckwheat....do....	....	....	....	....	....
Potatoes....do....	202,000	78	2,590	1 15	232,300
Tobacco....pounds.	343,000	750	457	20.7	71,001
Hay....tons.	19,500	1.05	18,571	20 50	399,750
Total....	....	....	2,662,049	....	27,993,611

Table showing the product of each principal crop, &c.—Continued.

Products.	Quantity produced in 1873.	Average yield per acre.	Number of acres in each crop.	Value per bushel, pound, or ton.	Total valuation.
FLORIDA.					
Indian corn........bushels.	2,112,000	10.4	203,077	$1 11	$2,344,320
Wheat........do....					
Rye........do....					
Oats........do....	109,000	13	8,384	1 02	111,180
Barley........do....					
Buckwheat........do....					
Potatoes........do....					
Tobacco........pounds.	80,000	601	133	33	26,400
Hay........tons.					
Total........			211,594		2,481,900
ALABAMA.					
Indian corn........bushel.	21,751,000	14.5	1,500,069	84	18,270,840
Wheat........do....	884,000	7.3	121,096	1 70	1,502,800
Rye........do....	20,000	9.4	2,127	1 56	31,200
Oats........do....	813,000	15.5	52,451	78	634 140
Barley........do....					
Buckwheat........do....					
Potatoes........do....	170,000	80	2,125	1 20	204,000
Tobacco........pounds.	200,000	727	275	15	30,000
Hay........tons.	17,000	1.20	14,167	18 50	314,500
Total........			1,692,310		20,987,480
MISSISSIPPI.					
Indian corn........bushel.	18,543,000	15.5	1,196,322	85	15,761,550
Wheat........do....	189,000	9.6	19,687	1 75	330,750
Rye........do....	15,000	10	1,500	1 60	24,000
Oats........do....	492,000	14.4	34,166	86	423,120
Barley........do....					
Buckwheat........do....					
Patatoes........do....	206,000	87	2,368	1 20	247,200
Tobacco........pounds.	85,000	739	115	17	14,450
Hay........tons.	13,000	1.27	10,236	20 25	263,250
Total........			1,264,394		17,064,320
LOUISIANA.					
Indian corn........bushels.	9,112,000	16.5	552,242	90	8,200,800
Wheat........do....					
Rye........do....					
Oats........do....	35,000	16.3	2,147	84	29,400
Barley........do....					
Buckwheat........do....					
Potatoes........do....	60,000	60	1,000	1.05	63,000
Tobacco........pounds.	35,000	777	45	18	6,300
Hay........tons.	13,100	1.20	10,917	17 50	229,250
Total........			566,351		8,528,750
TEXAS.					
Indian corn........bushels.	23,743,000	19	1,249,631	80	18,994,400
Wheat........do....	1,404,000	17	82,588	1 40	1,965,600
Rye........do....	50,000	17	2,941	1 10	55,000
Oats........do....	1,017,000	30	33,900	82	833,940
Barley........do....	57,000	30	1,900	1 04	59,280
Buckwheat........do....					
Potatoes........do....	248,000	90	2,755	1 65	409,200
Tobacco........pounds.	150,000	833	180	26.2	39,300
Hay........tons.	55,000	1.50	36,667	12 75	701,250
Total........			1,410,562		23,057,970
ARKANSAS.					
Indian corn........bushels.	16,208,000	23.5	689,702	80	12,966,400
Wheat........do....	785,000	10	78,500	1 50	1,177,500
Rye........do....	39,700	12.8	3,101	1 50	59,550
Oats........do....	786,000	23.4	33,590	70	550,200
Barley........do....					
Buckwheat........do....					
Potatoes........do....	408,000	80	5,100	1 00	408,000
Tobacco........pounds.	945,000	650	1,453	15.2	143,640
Hay........tons.	12,800	1.18	10,847	16 00	204,800
Total........			822,293		15,510,090

Table showing the product of each principal crop, &c.—Continued.

Products.	Quantity produced in 1873.	Average yield per acre.	Number of acres in each crop.	Value per bushel, pound, or ton.	Total valuation.
TENNESSEE.					
Indian corn........bushels.	42,604,000	22.5	1,893,511	$0 58	$24,710,320
Wheat........do....	7,414,000	7.2	1,029,722	1 33	9,860,620
Rye........do....	204,000	9	22,667	90	183,600
Oats........do....	5,613,000	20.6	272,476	41	2,301,330
Barley........do....	83,000	19.2	4,323	85	70,550
Buckwheat........do....	74,000	10.5	7,047	95	70,300
Potatoes........do....	1,009,000	75	13,453	66	665,940
Tobacco........pounds.	23,750,000	675	35,185	06	1,425,000
Hay........tons.	134,500	1.25	107,600	15 50	2,084,750
Total........	....	....	3,385,984	....	41,372,410
WEST VIRGINIA.					
Indian corn........bushels.	10,004,000	29	344,965	54	5,402,160
Wheat........do....	2,657,000	9.6	276,771	1 43	3,799,510
Rye........do....	261,000	12.8	20,390	84	219,240
Oats........do....	2,762,000	27	102,296	38	1,049,560
Barley........do....	56,000	24	2,333	92	51,520
Buckwheat........do....	59,000	17.1	3,450	81	47,790
Potatoes........do....	824,000	70	11,771	70	576,800
Tobacco........pounds.	2,967,000	775	3,828	09.3	275,931
Hay........tons.	197,500	1.10	179,545	14 00	2,765,000
Total........	....	....	945,349	....	14,187,511
KENTUCKY.					
Indian corn........bushels.	58,451,000	29.5	1,981,390	44	25,718,440
Wheat........do....	7,225,000	9	802,777	1 21	8,742,250
Rye........do....	1,107,000	8.5	130,235	77	852,390
Oats........do....	7,037,000	24	293,208	36	2,533,320
Barley........do....	218,000	20	10,900	1 00	218,000
Buckwheat........do....	3,600	15.3	235	86	3,096
Potatoes........do....	1,737,000	55	31,582	62	1,076,940
Tobacco........pounds.	152,000,000	734	207,000	07.2	10,944,000
Hay........tons.	337,900	1.23	274,715	13 00	4,392,706
Total........	....	....	3,732,042	....	54,481,136
OHIO.					
Indian corn........bushels.	88,422,000	35	2,526,343	42	37,137,240
Wheat........do....	18,567,000	12	1,547,250	1.31	24,322,770
Rye........do....	401,000	11	36,454	75	300,750
Oats........do....	23,090,000	27	855,185	35	8,081,500
Barley........do....	1,576,000	21.8	72,293	98	1,544,480
Buckwheat........do....	191,000	11.4	16,754	99	189,090
Potatoes........do....	6,045,000	85	71,117	88	5,319,600
Tobacco........pounds.	32,500,000	1,181	27,500	05.5	1,787,500
Hay........tons.	1,903,000	1.05	1,812,381	14 61	27,802,830
Total........	....	....	6,965,277	....	106,485,760
MICHIGAN.					
Indian corn........bushels.	14,099,000	31	454,806	47	6,626,530
Wheat........do....	14,214,000	12.2	1,165,082	1 35	19,188,900
Rye........do....	218,000	13.5	16,148	72	156,960
Oats........do....	8,878,000	30.2	293,973	34	3,018,520
Barley........do....	515,000	18	28,611	91	468,650
Buckwheat........do....	378,000	14.3	26,433	78	294,840
Potatoes........do....	6,910,000	75	92,133	76	5,251,600
Tobacco........pounds.	....	....	....	....	....
Hay........tons.	1,018,500	1.15	885,652	14 00	14,259,000
Total........	....	....	2,962,838	....	49,265,000
INDIANA.					
Indian corn........bushels.	67,840,000	25.6	2,650,000	40	27,136,000
Wheat........do....	20,832,000	11.2	1,860,000	1 22	25,415,040
Rye........do....	397,000	14.2	27,958	71	281,870
Oats........do....	11,400,000	20	570,000	32	3,648,000
Barley........do....	568,000	22.2	25,585	1 06	602,080
Buckwheat........do....	139,000	12.1	11,487	88	122,320
Potatoes........do....	2,520,000	56	45,000	85	2,142,000
Tobacco........pounds.	15,600,000	800	19,500	06	936,000
Hay........tons.	893,300	1.25	714,640	11 50	10,272,950
Total........	....	....	5,924,170	....	70,556,260

Table showing the product of each principal crop, &c.—Continued.

Products.	Quantity produced in 1873.	Average yield per acre.	Number of acres in each crop.	Value per bushel, pound, or ton.	Total valuation.
ILLINOIS.					
Indian corn.......bushels.	143, 634, 000	21	6, 839, 714	$0 32	$45, 962, 880
Wheat.......do....	28, 417, 000	13. 5	2, 104, 963	1 10	31, 258, 700
Rye.......do....	2, 078, 000	15. 5	134, 064	58	1, 205, 240
Oats.......do....	35, 360, 000	30	1, 178, 666	28	9, 900, 800
Barley.......do....	2, 280, 000	23	99, 130	95	2, 166, 000
Buckwheat.......do....	90, 000	8. 5	10, 588	99	89, 100
Potatoes.......do....	5, 510, 000	40	137, 750	1 12	6, 171, 200
Tobacco.......pounds.	7, 575, 000	850	8, 911	09	681, 750
Hay.......tons.	2, 350, 000	1. 25	1, 880, 000	8 75	20, 562, 500
Total.......	....	....	12, 393, 786	....	117, 998, 170
WISCONSIN.					
Indian corn.......bushels.	16, 308, 000	30	543, 600	44	7, 175, 520
Wheat.......do....	26, 322, 000	16. 5	1, 595, 273	97	25, 532, 340
Rye.......do....	1, 240, 000	15. 7	78, 981	62	768, 800
Oats.......do....	18, 862, 000	35	538, 914	33	6, 224, 460
Barley.......do....	1, 515, 000	26. 6	56, 955	1 08	1, 636, 200
Buckwheat.......do....	289, 000	11	26, 273	92	265, 880
Potatoes.......do....	4, 964, 000	71	69, 915	80	3, 971, 200
Tobacco.......pounds.	3, 750, 000	1, 050	3, 571	06	225, 000
Hay.......tons.	1, 370, 000	1. 30	1, 053, 846	9 50	13, 015, 000
Total.......	....	....	3, 967, 328	....	58, 814, 400
MINNESOTA.					
Indian corn.......bushels.	7, 189, 000	31. 5	228, 222	41	2, 947, 490
Wheat.......do....	28, 056, 000	18. 3	1, 533, 115	80	22, 444, 800
Rye.......do....	160, 000	20. 2	7, 919	51	81, 600
Oats.......do....	13, 100, 000	36. 1	362, 485	33	4, 323, 000
Barley.......do....	1, 060, 000	26. 6	39, 863	77	816, 200
Buckwheat.......do....	45, 000	12. 7	3, 548	82	36, 900
Potatoes.......do....	2, 900, 000	99	29, 293	63	1, 827, 000
Tobacco.......pounds.	....	....	....	....	....
Hay.......tons.	843, 100	1. 38	610, 942	5 60	4, 721, 360
Total.......	....	....	2, 815, 387	....	37, 198, 350
IOWA.					
Indian corn.......bushels.	105, 200, 000	29	3, 627, 586	31	32, 612, 000
Wheat.......do....	34, 600, 000	13	2, 661, 538	79	27, 334, 000
Rye.......do....	517, 000	18	28, 722	48	248, 160
Oats.......do....	21, 130, 000	33	640, 303	27	5, 705, 100
Barley.......do....	4, 500, 000	19	236, 842	73	3, 285, 000
Buckwheat.......do....	85, 000	10. 5	8, 095	95	80, 750
Potatoes.......do....	3, 315, 000	44	75, 341	88	2, 917, 200
Tobacco.......pounds.	....	....	....	....	....
Hay.......tons.	1, 747, 200	1. 25	1, 397, 760	6 25	10, 920, 000
Total.......	....	....	8, 676, 187	....	83, 102, 210
MISSOURI.					
Indian corn.......bushels.	70, 846, 000	23. 5	3, 014, 723	38	26, 921, 480
Wheat.......do....	11, 927, 000	12. 8	931, 797	1 13	13, 477, 510
Rye.......do....	446, 000	14. 5	30, 758	64	285, 440
Oats.......do....	15, 670, 000	28	559, 643	30	4, 701, 000
Barley.......do....	266, 000	21	12, 667	86	228, 760
Buckwheat.......do....	26, 000	12. 5	2, 080	77	20, 020
Potatoes.......do....	1, 839, 000	38	48, 395	87	1, 599, 930
Tobacco.......pounds.	13, 200, 000	800	16, 500	08. 8	1, 161, 600
Hay.......tons.	601, 000	1. 25	480, 800	9 50	5, 709, 500
Total.......	....	....	5, 097, 363	....	54, 105, 240
KANSAS.					
Indian corn.......bushels.	47, 000, 000	39. 1	1, 202, 046	31	14, 570, 000
Wheat.......do....	4, 330, 000	14	309, 286	1 00	4, 330, 000
Rye.......do....	310, 000	11	28, 181	56	173, 600
Oats.......do....	9, 360, 000	33	283, 636	23	2, 152, 800
Barley.......do....	515, 000	27. 5	18, 727	70	360, 500
Buckwheat.......do....	90, 000	12. 5	7, 200	80	72, 000
Potatoes.......do....	3, 000, 000	100	30, 000	94	2, 820, 000
Tobacco.......pounds.	220, 000	611	360	10	22, 000
Hay.......tons.	977, 000	1. 50	651, 333	3 90	3, 810, 300
Total.......	....	....	2, 530, 769	....	28, 311, 200

Table showing the product of each principal crop, &c.—Continued.

Products.	Quantity produced in 1873.	Average yield per acre.	Number of acres in each crop.	Value per bushel, pound, or ton.	Total valuation.
NEBRASKA.					
Indian corn .... bushels.	7, 000, 000	35	200, 000	$0 28	$1, 960, 000
Wheat .... do....	3, 584, 000	15. 5	231, 226	75	2, 688, 000
Rye .... do....	30, 000	16	1, 875	53	15, 900
Oats .... do....	2, 400, 000	30	80, 000	26	624, 000
Barley .... do....	355, 000	30	11, 833	82	291, 100
Buckwheat .... do....	2, 600	14. 5	179	67	1, 742
Potatoes .... do....	383, 000	28	13, 678	98	375. 340
Tobacco .... pounds.	....	....	....	....	....
Hay .... tons.	198, 400	1. 40	141, 714	4. 50	892, 800
Total	....	....	680, 505	....	6, 848, 882
CALIFORNIA.					
Indian corn .... bushels.	1, 540, 000	41	37, 561	73	1, 124, 200
Wheat .... do....	21, 504, 000	13. 5	1, 592, 889	1 32	28, 385, 280
Rye .... do....	46, 000	20	2, 300	90	41, 400
Oats .... do....	2, 182, 000	30	72, 733	84	1, 832, 880
Barley .... do....	10, 213, 991	26. 5	385, 433	85	8, 681, 892
Buckwheat .... do....	20, 000	23. 5	851	1 20	24, 000
Potatoes .... do....	2, 800, 000	110	25, 454	85	2, 380, 000
Tobacco .... pounds.	....	....	....	....	....
Hay .... tons.	713, 000	1. 37	520, 438	16 50	11, 764, 500
Total	....	....	2, 637, 659	....	54, 234, 152
OREGON.					
Indian corn .... bushels.	94, 000	30	3, 133	60	56, 400
Wheat .... do....	3, 127, 000	19	164, 579	90	2, 814, 300
Rye .... do....	4, 300	25	172	82	3, 526
Oats .... do....	2, 416, 000	37. 5	64, 427	42	1, 014, 720
Barley .... do....	364, 000	28	13, 000	52	189, 280
Buckwheat .... do....	800	20. 3	39	1 20	960
Potatoes .... do....	723, 000	130	5, 561	56	404, 880
Tobacco .... pounds.	....	....	....	....	....
Hay .... tons.	103, 600	1. 40	74, 000	10 50	1, 087, 800
Total	....	....	324, 911	....	5, 571, 866
NEVADA.					
Indian corn .... bushels.	12, 000	30	400	1 60	19, 200
Wheat .... do....	345, 000	20	17, 250	1 75	603, 750
Rye .... do....	....	....	....	....	....
Oats .... do....	75, 000	33	2, 273	1 00	75, 000
Barley .... do....	420, 000	28	15, 000	1 65	693, 000
Buckwheat .... do....	....	....	....	....	....
Potatoes .... do....	175, 000	110	1, 591	2 20	385, 000
Tobacco .... pounds.	....	....	....	....	....
Hay .... tons.	55, 000	1. 30	42, 308	20 00	1, 100, 000
Total	....	....	78, 822	....	2, 875, 950
THE TERRITORIES.					
Indian corn .... bushels.	1, 242, 000	28. 5	43, 579	97	1, 204, 740
Wheat .... do....	2, 340, 000	23	101, 739	98	2, 293, 200
Rye .... do....	15, 000	23. 5	638	90	13, 500
Oats .... do....	1, 426, 000	35. 1	40, 627	70	998, 200
Barley .... do....	414, 000	32	12, 937	80	331, 200
Buckwheat .... do....	....	....	....	....	....
Potatoes .... do....	875, 000	120	7, 292	71	621, 250
Tobacco .... pounds.	....	....	....	....	....
Hay .... tons.	152, 400	1. 40	108, 857	13 00	1, 981, 200
Total	....	....	315, 669	....	7, 443, 299

Table showing the average yield per acre and price per bushel, pound, or ton of farm products for the year 1873.

States	CORN.		WHEAT.		RYE.		OATS.		BARLEY.		BUCKWHEAT.		POTATOES.		TOBACCO.		HAY.	
	Bushels.	Price per bushel.	Bushels.	Price per bushel.	Bushels.	Price per bushel.	Bushels.	Price per bushel.	Bushels.	Price per bushel.	Bushels.	Price per bushel.	Bushel.	Price per bushel.	Pounds.	Price per pound.	Tons.	Price per ton.
Maine	24	$0 91	11	$1 90	14.5	$1 15	21	$0 58	16.7	$0 91	17.4	$0 72	117	$0 52	......	......	.93	$12 20
New Hampshire	37.5	92	15	1 88	17.2	1 10	36	55	20	1 00	18.7	75	150	48	1,285	$0 15	1.05	15 00
Vermont	31	85	16	1 67	16.1	95	32.6	49	23.8	86	20.5	72	140	44	1,272	20	1.10	13 38
Massachusetts	35	84	19	1 66	17	1 04	33.3	59	22	1 03	15.6	86	125	70	1,459	17	1.04	25 10
Rhode Island	28.7	92	......	......	16.2	97	31.3	61	25.5	1 15	......	......	96	81	......	......	.95	37 50
Connecticut	30	94	18	1 65	16	1 06	32	60	23.5	1 10	18.2	98	97	83	1,647	23	1.09	25 00
New York	31	70	13.5	1 60	14	86	31	43	21.2	1 10	19.7	77	103	54	1,000	11	1.02	18 00
New Jersey	36	62	16.2	1 65	14.1	85	26.5	49	24	1 10	16.5	96	90	67	......	......	1.03	24 50
Pennsylvania	35.1	60	14.2	1 50	14.5	81	30.2	43	20.6	1 05	19.5	84	96	65	1,186	12.3	1.15	17 80
Delaware	19	53	11	1 68	11	87	19.3	46	17	90	23	70	97	78	......	......	.81	26 00
Maryland	21.4	68	11.3	1 54	12.5	80	18.8	44	18	85	17	75	80	70	877	7.7	1.00	19 00
Virginia	19	59	7.5	1 45	9.7	78	16.3	44	18.5	70	17.9	70	70	71	608	9.2	1.00	17 20
North Carolina	14.2	64	6.2	1 55	8.1	85	16.3	56	16.6	66	16.6	65	94	69	591	9	1.20	13 00
South Carolina	9.5	94	5.5	2 25	7	1 60	14	85	20	2 00	......	......	70	1 10	545	10	1.10	27 00
Georgia	12.3	82	7	1 75	6	1 64	13.4	75	13.2	1 20	......	......	78	1 15	750	20.7	1.05	20 50
Florida	10.4	1 11	......	......	......	......	13	1 02	......	......	......	......	......	......	601	33	......	......
Alabama	14.5	84	7.3	1 70	9.4	1 56	15.5	78	......	......	......	......	80	1 20	727	15	1.20	18 50
Mississippi	15.5	85	9.6	1 75	10	1 60	14.4	86	......	......	......	......	87	1 20	739	17	1.27	20 25
Louisiana	16.5	90	......	......	......	......	16.3	84	......	......	......	......	60	1 05	777	18	1.20	17 50
Texas	19	80	17	1 40	17	1 10	30	82	30	1 04	......	......	90	1 65	833	26.2	1.50	12 75
Arkansas	23.5	80	10	1 50	12.8	1 50	23.4	70	......	......	......	......	80	1 00	650	15.2	1.18	16 00
Tennessee	22.5	58	7.2	1 33	9	90	20.6	41	19.2	85	10.5	95	75	66	675	6	1.25	15 50
West Virginia	29	54	9.6	1 43	12.8	84	27	38	24	92	17.1	81	70	70	775	9.3	1.10	14 00
Kentucky	29.5	44	9	1 21	8 5	77	24	36	20	1 00	15.3	86	55	62	734	7.2	1.23	13 00
Ohio	35	42	12	1 31	11	75	27	35	21.8	98	11.4	99	85	88	1,181	5.5	1.05	14 61
Michigan	31	47	12.2	1 35	13.5	72	30.2	34	18	91	14.3	78	75	76	......	......	1.15	14 00
Indiana	25.6	40	11.2	1 22	14.2	71	20	32	22.2	1 06	12.1	88	56	85	800	6	1.25	11 50
Illinois	21	32	13.5	1 10	15.5	58	30	28	23	95	8.5	99	40	112	850	9	1.25	8 75
Wisconsin	30	44	16.5	97	15.7	62	35	33	26.6	1 08	11	92	71	80	1,050	6	1.30	9 50
Minnesota	31.5	41	18 3	80	20.2	51	36.1	33	26.6	77	12.7	82	99	63	......	......	1.38	5 60
Iowa	29	31	13	79	18	48	33	27	19	73	10.5	95	44	88	......	......	1.25	6 25
Missouri	23.5	38	12.8	1 13	14.5	64	28	30	21	86	12.5	77	38	87	800	8.8	1.25	9 50
Kansas	39.1	31	14	1 00	11	56	33	23	27.5	70	12.5	80	100	94	611	10	1.50	3 90
Nebraska	35	28	15.5	75	16	53	30	26	30	82	14.5	67	28	98	......	......	1.40	4 50
California	41	73	13.5	1 32	20	90	30	84	26.5	85	23.5	1 20	110	85	......	......	1.37	16 50
Oregon	30	60	19	90	25	82	37.5	42	28	52	20.3	1 20	130	56	......	......	1.40	10 50
Nevada	30	1 60	20	1 75	......	......	33	1 00	28	1 65	......	......	110	220	......	......	1.30	20 00
The Territories	28.5	97	23	98	23.5	90	35.1	70	32	80	......	......	120	71	......	......	1.40	13 00

Summary for each State, showing the product, the number of acres, and the value of each crop for 1873.

States.	INDIAN CORN.			WHEAT.			RYE.		
	Bushels.	Acres.	Value of crop.	Bushels.	Acres.	Value of crop.	Bushels.	Acres.	Value of crop.
Maine	852,000	35,500	$775,320	219,000	19,909	$416,100	26,000	1,793	$29,900
New Hampshire	1,305,000	34,800	1,2[illegible]6,600	169,000	11,267	317,720	40,000	2,325	44,000
Vermont	1,748,000	56,387	1,485,800	399,000	24,937	666,330	60,000	3,727	57,000
Massachusetts	1,446,000	41,314	1,214,640	31,000	1,631	51,460	246,000	14,470	255,840
Rhode Island	297,000	10,348	273,240	......	......	......	20,000	1,234	19,400
Connecticut	1,534,000	51,133	1,441,960	39,700	2,205	65,505	323,000	20,187	342,380
New York	17,692,000	570,710	12,384,400	7,047,000	522,000	11,275,200	1,853,000	132,357	1,593,580
New Jersey	10,442,000	290,055	6,474,040	1,948,000	120,247	3,214,200	485,000	34,397	412,250
Pennsylvania	36,929,000	1,052,109	22,157,400	15,548,000	1,094,929	23,322,000	3,283,000	226,414	2,659,230
Delaware	2,960,000	155,789	1,568,800	588,000	53,454	987,840	11,000	1,000	9,570
Maryland	10,451,000	488,364	7,106,680	5,262,000	465,604	8,103,480	309,000	24,720	247,200
Virginia	19,275,000	1,014,474	11,372,250	5,788,000	771,733	8,392,600	465,000	47,938	362,700
North Carolina	21,130,000	1,488,028	13,523,200	2,795,000	450,806	4,332,250	307,000	37,901	260,950
South Carolina	9,245,000	973,158	8,690,300	522,000	94,909	1,174,500	45,000	6,428	72,000
Georgia	24,014,000	1,952,858	19,691,480	2,176,000	310,857	3,808,000	110,000	18,333	180,400
Florida	2,112,000	203,077	2,344,320	......	......	......	......	......	......
Alabama	21,751,000	1,500,069	18,270,840	884,000	121,096	1,502,800	20,000	2,127	31,200
Mississippi	18,543,000	1,196,322	15,761,550	189,000	19,687	330,750	15,000	1,500	24,000
Louisiana	9,112,000	552,242	8,200,800	......	......	......	......	......	......
Texas	23,743,000	1,249,631	18,994,400	1,404,060	82,588	1,965,600	50,000	2,941	55,000
Arkansas	16,208,000	689,702	12,966,400	785,000	78,500	1,177,500	39,700	3,101	59,550
Tennessee	42,604,000	1,893,511	24,710,320	7,414,000	1,029,722	9,860,620	204,000	22,667	183,600
West Virginia	10,004,000	344,965	5,402,160	2,657,000	276,771	3,799,510	261,000	20,390	219,240
Kentucky	58,451,000	1,981,390	25,718,440	7,225,000	802,777	8,742,250	1,107,000	130,235	852,390
Ohio	88,422,000	2,526,343	37,137,240	18,567,000	1,547,250	24,322,770	401,000	36,454	300,750
Michigan	14,099,000	454,806	6,626,530	14,214,000	1,165,082	19,188,900	218,000	16,148	156,960
Indiana	67,840,000	2,650,000	27,136,000	20,832,000	1,860,000	25,415,040	397,000	27,958	281,870
Illinois	143,634,090	6,839,714	45,962,880	28,417,000	2,104,963	31,258,700	2,078,000	134,064	1,205,240
Wisconsin	16,308,000	543,600	7,175,520	26,322,000	1,595,273	25,532,340	1,240,000	78,981	768,800
Minnesota	7,189,000	228,222	2,947,490	28,056,000	1,533,115	22,444,800	160,000	7,919	81,600
Iowa	105,200,000	3,627,586	32,612,000	34,600,000	2,661,538	27,334,000	517,000	28,722	248,160
Missouri	70,846,000	3,014,723	26,921,480	11,927,000	931,797	13,477,510	446,000	30,758	285,440
Kansas	47,000,000	1,262,046	14,570,000	4,330,000	309,286	4,330,000	310,000	28,181	173,600
Nebraska	7,000,000	200,000	1,960,000	3,584,000	231,226	2,688,000	30,000	1,875	15,900
California	1,540,000	37,561	1,124,200	21,504,000	1,592,889	28,385,280	46,000	2,300	41,400
Oregon	94,000	3,133	56,400	3,127,000	164,579	2,814,300	4,300	172	3,526
Nevada	12,000	400	19,200	345,000	17,250	603,750	......	......	......
The Territories	1,242,000	43,579	1,204,740	2,340,000	101,739	2,293,200	15,000	638	13,500
Total	932,274,000	39,197,148	447,183,020	281,254,700	22,171,676	323,594,805	15,142,000	1,150,355	11,548,126

States.	OATS.			BARLEY.			BUCKWHEAT.		
	Bushels.	Acres.	Value of crop.	Bushels.	Acres.	Value of crop.	Bushels.	Acres.	Value of crop.
Maine	1,305,000	62,143	$756,900	410,000	24,551	$373,100	371,000	21,322	$267,120
New Hampshire	1,003,000	27,861	551,650	77,000	3,850	77,000	77,000	4,117	57,750
Vermont	3,579,000	109,765	1,753,710	97,000	4,075	83,420	365,000	17,805	262,800
Massachusetts	665,000	19,970	392,350	110,000	5,000	113,300	50,000	3,205	43,000
Rhode Island	150,000	4,792	91,500	32,500	1,274	37,375			
Connecticut	956,000	29,875	573,600	23,000	979	25,300	104,000	5,714	101,920
New York	27,548,000	888,645	11,845,640	5,876,000	277,170	6,463,600	2,947,000	149,594	2,269,190
New Jersey	2,737,000	103,283	1,341,130	7,200	300	7,920	288,000	17,454	276,480
Pennsylvania	31,229,000	1,034,073	13,428,470	398,000	19,320	417,900	2,022,000	103,692	1,698,480
Delaware	397,000	20,570	190,628	1,800	106	1,620	1,200	52	840
Maryland	2,798,000	142,830	1,231,120	10,600	589	9,010	60,000	3,529	45,000
Virginia	5,397,000	331,104	2,374,680	7,000	378	4,900	40,000	2,234	28,000
North Carolina	3,146,000	193,006	1,761,760	3,200	193	2,112	19,500	1,175	12,675
South Carolina	617,000	44,071	524,450	6,300	315	12,600			
Georgia	4,800,000	358,209	3,600,000	8,900	674	10,680			
Florida	109,000	8,324	111,180						
Alabama	813,000	52,451	634,140						
Mississippi	492,000	34,166	423,120						
Louisiana	35,000	2,147	20,400						
Texas	1,017,000	33,900	833,940	57,000	1,900	59,280			
Arkansas	786,000	33,500	550,200						
Tennessee	5,613,000	272,476	2,301,330	83,000	4,323	70,550	74,000	7,047	70,300
West Virginia	2,762,000	102,296	1,049,560	56,000	2,330	51,520	59,000	3,450	47,790
Kentucky	7,037,000	293,208	2,533,320	218,000	10,900	218,000	3,600	235	3,096
Ohio	23,090,000	855,185	8,081,500	1,576,000	72,293	1,544,480	191,000	16,754	169,090
Michigan	8,878,000	293,573	3,018,520	515,000	28,611	468,650	378,000	26,433	294,840
Indiana	11,400,000	570,000	3,648,000	568,000	25,585	602,080	139,000	11,487	122,320
Illinois	35,360,000	1,178,666	9,900,800	2,280,000	99,130	2,166,000	90,000	10,588	89,100
Wisconsin	18,862,000	538,914	6,224,460	1,515,000	56,955	1,636,200	289,000	26,273	265,880
Minnesota	13,100,000	362,485	4,323,000	1,060,000	39,863	816,200	45,000	3,548	36,900
Iowa	21,130,000	640,303	5,705,100	4,500,000	236,842	3,285,000	85,000	8,095	80,750
Missouri	15,670,000	559,643	4,701,000	266,000	12,667	228,760	26,000	2,080	20,020
Kansas	9,300,000	283,636	2,152,800	515,000	18,727	360,500	90,000	7,200	72,000
Nebraska	2,400,000	80,000	624,000	355,000	11,833	291,100	2,600	179	1,742
California	2,182,000	72,733	1,832,880	10,213,991	365,433	8,681,892	20,000	851	24,000
Oregon	2,416,000	64,427	1,014,720	364,000	13,000	189,280	800	39	960
Nevada	75,000	2,273	75,000	420,000	15,000	693,000			
The Territories	1,426,000	40,627	998,200	414,000	12,937	331,200			
Total	270,340,000	9,751,700	101,175,750	32,044,491	1,387,106	29,333,520	7,837,700	454,152	6,382,043

States.	POTATOES.			TOBACCO.			HAY.		
	Bushels.	Acres.	Value of crop.	Pounds.	Acres.	Value of crop.	Tons.	Acres.	Value of crop.
Maine	2,997,000	25,615	$1,558,440	....	....	....	1,204,200	1,294,839	$14,691,240
New Hampshire	3,191,000	21,273	1,531,680	450,000	350	$67,500	723,800	669,333	10,857,000
Vermont	5,088,000	36,343	2,238,720	350,000	275	70,000	893,200	612,000	11,951,016
Massachusetts	2,425,000	19,400	1,697,500	8,200,000	5,620	1,394,000	409,200	393,461	10,270,920
Rhode Island	550,000	5,729	445,500	....	....	....	76,500	80,526	2,103,750
Connecticut	2,273,000	23,433	1,886,590	8,600,000	5,220	1,978,000	512,600	470,275	12,815,000
New York	24,925,000	241,990	13,459,500	2,950,000	2,950	324,500	4,199,800	4,117,451	75,596,400
New Jersey	3,560,000	39,555	2,385,200	....	....	....	416,300	404,175	10,199,350
Pennsylvania	10,602,000	110,437	6,891,300	15,000,000	12,640	1,845,000	2,446,400	2,127,304	43,545,920
Delaware	222,000	2,238	173,160	....	....	....	31,000	38,271	806,000
Maryland	1,336,000	16,700	935,200	19,300,000	22,000	1,486,100	169,400	169,400	3,218,600
Virginia	1,242,000	17,743	881,820	50,000,000	82,200	4,600,000	160,000	160,000	2,752,000
North Carolina	780,000	8,298	538,200	14,500,000	24,500	1,305,000	94,500	78,750	1,228,500
South Carolina	75,000	1,071	82,500	60,000	110	6,000	22,400	20,363	604,800
Georgia	202,000	2,590	232,300	343,000	457	71,001	19,500	18,571	399,750
Florida	....	....	....	80,000	133	26,400	....	....	....
Alabama	170,000	2,125	204,000	200,000	275	30,000	17,000	14,167	314,500
Mississippi	206,000	2,368	247,200	85,000	115	14,450	13,000	10,236	263,250
Louisiana	60,000	1,000	63,000	35,000	45	6,300	13,100	10,917	229,250
Texas	248,000	2,755	409,200	150,000	180	39,300	55,000	36,667	701,250
Arkansas	408,000	5,100	408,000	945,000	1,453	143,640	12,800	10,847	204,800
Tennessee	1,009,000	13,453	665,940	23,750,000	35,185	1,425,000	134,500	107,600	2,084,750
West Virginia	824,000	11,771	576,800	2,967,000	3,828	275,931	197,500	179,545	2,765,000
Kentucky	1,737,000	31,582	1,676,940	152,000,000	207,000	10,944,000	337,900	274,715	4,392,700
Ohio	6,045,000	71,117	5,319,600	32,500,000	27,500	1,787,500	1,903,000	1,812,381	27,802,830
Michigan	6,910,000	92,133	5,251,600	....	....	....	1,018,500	865,652	14,259,000
Indiana	2,520,000	45,000	2,142,000	15,600,000	19,500	936,000	893,300	714,640	10,272,950
Illinois	5,510,000	137,750	6,171,200	7,575,000	8,911	681,750	2,350,000	1,880,000	20,562,500
Wisconsin	4,964,000	69,915	3,971,200	3,750,000	3,571	225,000	1,370,000	1,053,846	13,015,000
Minnesota	2,900,000	29,293	1,827,000	....	....	....	843,100	610,942	4,721,360
Iowa	3,315,000	75,341	2,917,200	....	....	....	1,747,200	1,397,760	10,920,000
Missouri	1,839,000	48,395	1,599,930	13,200,000	16,500	1,161,000	601,000	480,800	5,709,500
Kansas	3,000,000	30,000	2,820,000	220,000	360	22,000	977,000	651,333	3,810,300
Nebraska	383,000	13,678	375,340	....	....	....	198,400	141,714	892,800
California	2,800,000	25,454	2,380,000	....	....	....	713,000	520,438	11,764,500
Oregon	723,000	5,561	404,880	....	....	....	103,600	74,000	1,087,800
Nevada	175,000	1,591	385,000	....	....	....	55,000	42,308	1,100,000
The Territories	875,000	7,292	621,250	....	....	....	152,400	108,857	1,981,200
Total	106,089,000	1,295,139	74,774,890	372,810,000	480,878	30,805,972	25,085,100	21,894,084	339,895,406

A general summary, showing the estimated quantities, number of acres, and aggregate value of the principal crops of the farm in 1873.

Products.	No. of bushels.	No. of acres.	Value.
Indian corn........bushels.	932, 274, 000	39, 197, 148	$447, 183, 020
Wheat........do....	281, 254, 700	22, 171, 676	323, 594, 805
Rye........do....	15, 142, 000	1, 150, 355	11, 548, 126
Oats........do....	270, 340, 000	9, 751, 700	101, 175, 750
Barley........do....	32, 044, 491	1, 387, 106	29, 333, 529
Buckwheat........do....	7, 837, 700	454, 152	6, 382, 043
Potatoes........do....	106, 089, 000	1, 295, 139	74, 774, 890
Total........	1, 644, 981, 891	75, 407, 276	993, 992, 163
Tobacco........pounds.	372, 810, 000	480, 878	30, 865, 972
Hay........tons.	25, 085, 100	21, 894, 084	339, 895, 486
Cotton........bales.	4, 200, 000	9, 350, 000	312, 480, 000
Total........	....	107, 132, 238	1, 677, 233, 621

Table showing the average yield and cash value per acre, and price per bushel, pound, or ton, of farm products for the year 1873.

Products.	Average yield per acre.	Average price per bushel.	Average value per acre.	Products.	Average yield per acre.	Average price per bushel, pound or ton.	Average value per acre.
Indian corn....bush.	23. 8—	$0 48 —	$11 41	Buckwheat......bush.	17. 2 +	$0 81. 4 +	$14 05
Wheat........do..	12. 7—	1 15 +	14 59	Potatoes........do..	81. 9 +	70. 5—	57 73
Rye........do..	13. 1 +	76. 2 +	10 04	Tobacco........lbs.	775 +	8. 3—	64 10
Oats........do..	27. 7 +	37. 4 +	10 37	Hay........tons.	1. 14 +	13 55	15 52
Barley........do..	23. 1 +	91. 5 +	21 15	Cotton........lbs.	208. 9 —	16	33 42

Table showing the average cash value of farm products per acre for the year 1873.

States.	Corn.	Wheat.	Rye.	Oats.	Barley.	Buck-wheat.	Pota-toes.	Tobacco.	Hay.
Maine........	$21 81	$20 90	$16 67	$12 18	$15 20	$12 53	$60 84	....	$11 34
New Hampshire........	34 50	23 20	18 92	19 80	20 00	14 02	72 00	$192 75	15 75
Vermont........	26 35	26 72	15 29	15 97	20 47	14 76	61 60	254 40	14 72
Massachusetts........	29 40	31 54	17 68	19 65	22 66	13 41	87 50	248 03	26 10
Rhode Island........	26 40	....	15 71	19 09	29 32	....	77 76	....	26 12
Connecticut........	28 20	29 70	16 96	19 20	25 85	17 83	80 51	378 81	27 25
New York........	21 70	21 60	12 04	13 33	23 32	15 17	55 62	110 00	18 36
New Jersey........	22 32	25 73	11 98	12 98	26 49	15 84	60 30	....	25 23
Pennsylvania........	21 00	21 30	11 74	12 98	21 63	16 38	62 40	145 88	20 47
Delaware........	10 07	18 48	9 57	8 88	15 30	16 10	75 66	....	21 06
Maryland........	14 55	17 40	10 00	8 27	15 30	12 75	56 00	67 53	19 00
Virginia........	11 21	10 87	7 56	7 17	12 95	12 53	49 70	55 93	17 20
North Carolina........	9 09	9 61	6 88	9 13	10 95	10 79	64 86	53 19	15 60
South Carolina........	8 93	12 37	11 20	11 00	40 00	....	77 00	54 50	29 70
Georgia........	10 08	12 25	9 84	10 05	15 84	....	89 70	155 25	21 52
Florida........	11 54	....	....	13 26	....	....	....	198 33	....
Alabama........	12 18	12 41	14 66	12 09	....	....	96 00	109 05	22 20
Mississippi........	13 17	16 80	16 00	12 38	....	....	104 40	125 63	25 72
Louisiana........	14 85	....	....	13 69	....	....	63 00	139 86	21 00
Texas........	15 20	23 80	18 70	24 60	31 20	....	148 59	218 24	19 12
Arkansas........	18 80	15 00	19 20	16 38	....	....	80 00	98 80	18 88
Tennessee........	13 05	9 57	8 10	8 44	16 32	9 97	49 50	40 50	19 37
West Virginia........	15 66	13 73	10 75	10 23	22 08	13 85	49 00	72 07	15 40
Kentucky........	12 98	10 89	6 54	8 64	20 00	13 16	34 10	52 85	15 99
Ohio........	14 70	15 72	8 25	9 45	21 36	11 28	74 80	64 95	15 34
Michigan........	14 57	16 47	9 72	10 27	16 38	11 15	57 00	....	16 10
Indiana........	10 24	13 66	10 08	6 40	23 53	10 05	47 60	48 00	14 37
Illinois........	6 72	14 85	8 99	8 40	21 85	8 41	44 80	76 50	10 94
Wisconsin........	13 20	16 00	9 73	11 55	28 73	10 12	56 80	63 00	12 35
Minnesota........	12 91	14 64	10 30	11 91	20 48	10 41	62 37	....	7 73
Iowa........	8 90	10 27	8 64	8 91	13 87	9 97	38 72	....	7 81
Missouri........	8 93	14 46	9 28	8 40	18 06	9 62	33 06	70 40	11 87
Kansas........	12 12	14 00	6 16	7 50	19 25	10 00	94 00	61 10	5 85
Nebraska........	9 80	14 62	8 48	7 80	24 60	9 71	27 44	....	6 30
California........	29 93	17 82	18 00	25 20	22 52	23 20	93 50	....	22 60
Oregon........	18 00	17 10	20 50	15 75	14 55	24 36	72 80	....	14 70
Nevada........	48 00	35 00	....	33 00	46 20	....	242 00	....	26 00
The Territories........	27 64	22 54	21 15	24 57	25 60	....	85 20	....	18 20

Total average cash value per acre.

States.	Average value per acre.	States.	Average value per acre.
Maine	$12 70	Texas	$16 35
New Hampshire	18 49	Arkansas	18 86
Vermont	17 43	Tennessee	12 22
Massachusetts	30 61	West Virginia	15 01
Rhode Island	28 59	Kentucky	14 60
Connecticut	31 57	Ohio	15 29
New York	19 59	Michigan	16 02
New Jersey	24 08	Indiana	11 91
Pennsylvania	20 06	Illinois	9 52
Delaware	13 74	Wisconsin	14 82
Maryland	16 70	Minnesota	13 21
Virginia	12 67	Iowa	9 58
North Carolina	10 06	Missouri	10 61
South Carolina	9 79	Kansas	11 19
Georgia	10 51	Nebraska	10 06
Florida	11 73	California	20 56
Alabama	12 40	Oregon	17 15
Mississippi	13 49	Nevada	36 48
Louisiana	15 06	The Territories	23 58

CONDITION OF FARM-ANIMALS.

The condition of domestic animals, upon farms, during the year 1873, has on the whole been favorable. The winter of 1872-'73 was one of unusual and protracted cold, but was dry and comparatively uniform in temperature, with few sudden changes and few storms of rain and sleet followed by freezing weather. There was, therefore, less of suffering and loss inflicted upon unsheltered animals by winter storms. The severity of the winter in certain sections induced greater care and more attention to feeding: Many stock-keepers, in regions in which winter care of animals has been extremely exceptional, appear to have reached the conclusion of the Kansas correspondent who wrote: "I have learned from observation that a cow, when well sheltered and watered, can be kept on less than one-half the feed required when left to the exposure of winter storms." It is certain that the districts in this country are very limited in which farmers can afford to winter stock without any provision for sheltering and feeding them; in point of literal fact, there are no regions in which some such provision for occasional emergencies is not necessary.

In the Pacific States and in the Territories, Utah forming the most prominent exception, the winter might be considered a mild and pleasant one; and in the Gulf States, especially in Texas, there was a marked exemption from storms of sleet and cold rains. In the Northwest the unprecedented snow-storm of January 7 caused considerable loss among unprotected cattle and sheep. The great abundance and cheapness of feeding supplies was an important factor in the good condition which was generally reported in the Northern and Western States. It was made quite manifest by the spring returns of condition that flocks and herds comfortably sheltered and sufficiently fed will pass through the winter in thriving condition. The losses in decrease in flesh and reduced vitality by neglect of stock-owners, could they be computed in money, would amount to many millions of dollars annually. It is one of the most serious of all the many wastes of rural industry. It should be remembered that an average depreciation of only 1 per cent. in the aggregate value of the farm-stock of the country amounts to $17,000,000.

CONDITION OF CATTLE IN THE SPRING.

The number of counties sending reports of condition of stock is 1,032, of which 238 return average condition, 500 above, and 294 below an average. In none of the New England States was there a report "below average;" in New York but 5 counties of 36 represented were thus characterized; none in New Jersey; 5 of 41 in Pennsylvania. In the Southern States, where the weather is milder and cattle are left in a large degree to shift for themselves, "below average" is the usual condition of most herds and flocks in the spring; yet the present record, like the weather, is milder than usual, a majority of the returns expressing inferior condition only in Alabama, Mississippi, Louisiana, Texas, Arkansas, and Tennessee, while in Virginia, North Carolina, South Carolina, Georgia, and Florida the returns from a majority of the counties indicated either average or superior condition. In West Virginia only one-third of the reports were unfavorable, less than half in Kentucky, one-sixth in Ohio, one-fifth in Indiana, only 3 of 51 counties reported in Illinois, one-seventh in Wisconsin, one-eighth in Minnesota, one-eighth in Iowa, one-fifth in Missouri, 1 in 33 in Kansas, one-eighth in Nebraska, one-tenth in California. In Oregon and in all the Territories but Utah all reports were favorable.

The great losses resulting from the utter neglect so common in the South, and the inhumanity of such treatment of living creatures essential to human comfort, and we may say to human existence, is painfully illustrated by such expressions as these: "Very poor, owing to intensely cold weather, want of food, and shelter." "The oldest inhabitants say they never saw the cattle so poor and weak as they are now, and two-tenths will be sure to die this month. One farmer told me he had lost twenty-four out of forty head." "They are dying from emaciation in large numbers." "Many have died from exposure and insufficient food." "A severe storm of sleet in the latter part of January [in Texas] killed an immense number of cattle." "Fully 50 per cent. have died this winter from the extreme severity of the weather and lack of grass to keep stock in living order, the range having given out." "If they survive, well and good; if not, their owners go and skin them and sell the hide for nearly as much as the animal would bring, at present prices. Thousands almost have died during the winter, which was very severe, and those which weathered it through are very poor yet."

There are increasing indications of a proper appreciation of the wastefulness and inhumanity of such neglect, as the following extracts from the correspondence of this section will show: "Good, owing to much better care than formerly. Our people are providing good shelter for stock. We find a great saving in food by doing so." "Our farmers [Virginia] are slowly but surely learning the importance of sheltering their stock in winter." "Farmers [Texas] were better prepared to feed their stock than usual." "Have stood the weather well, [Tennessee,] as a general thing they have been well fed."

CONDITION OF SHEEP.

The comparatively dry winter and the general cheapness and abundance of feed combined with the advanced price of wool not only to exempt sheep from exposure, want, and disease, but to keep them in a condition of unusual health and thrift. One correspondent emphasizes the remark that "*wool will not grow on poor and poorly fed sheep;* our wool-growers have learned this, and are practicing the more profitable method of early and continuous feeding." Another observes: "Long experience has convinced me that little or no disease ever troubles a lot of *fat* sheep." The principal exceptions to the generally favorable con-

dition of sheep through the past winter are found in the Gulf States, North Carolina, Tennessee, Kentucky, and West Virginia. Of 915 counties reporting comparative condition, 520 make returns above average, 235 average, and 160 below average. Only 2 of 40 New England counties return inferior condition, viz: Franklin, Maine, and Cheshire, New Hampshire; in the latter case, due to hay injured by wet weather in curing. In the Middle States only about one-twelfth of the reports were unfavorable, and a large majority were above average. In the Atlantic States, from Virginia southward, the reports indicating bad condition were less than one-fourth of the whole; in the Gulf States, one-third, and about the same proportion in Arkansas and Tennessee; in Kentucky and Missouri, about one-fourth; and in the States farther north, where protection is essential, one-tenth only of the reports were unfavorable. Throughout the whole region from the Missouri to the Pacific Ocean the proportion of unfavorable returns was very small.

Some gratifying indications are remarked in returns, relative both to better care and a more judicious attention to improvement of breeds and adaptation to local circumstances. In Grayson, Virginia, sheep "wintered better than usual, owing to considerable progress in the improvement of breeds; there is a marked contrast between the improvements of flocks now and one or two years ago." In Adair, Missouri: "Better than usual. Farmers are taking better care of their sheep than heretofore." In Grundy, Illinois: "Better than average, on account of the plenty and cheapness of corn and oats, and the value of wool;" in De Kalb they were "better provided with winter-quarters than formerly." In Outagamie, Wisconsin: "Look finely; *always do well when wool brings a good price.*" In Polk, Iowa: "Long experience has convinced me that little or no disease ever troubles a *fat* sheep." In Woodson, Kansas: "Much better than usual. *Wool will not grow on poor and poorly fed sheep.*"

Among the cases of loss from exposure and want of feed, the following may be named:

Fauquier, Va.: Have suffered more than other stock, but where properly sheltered and cared for but few losses. *McDuffie, Ga.:* Very bad; a great many of the sheep are unable to raise their young, from the fact that they are too poor to give nourishment enough to sustain life. We have lost twice as many as in previous winters within my recollection. *Limestone, Ala.:* Very poor; winter the severest ever known. About one-third of the early lambs died. *Richland, La.:* Many have died from exposure and insufficient food. *Navarro, Tex.:* Better than cattle, but not more than one-half of the lambs have been saved. *Boone, W. Va.:* Not as good as usual; great loss of lambs. *Trimble, Ky.:* The well provided for and sheltered look well; those not sheltered and cared for are poor. *Carroll, Ky.:* Below average; have required more care and food than usual owing to the sleet that covered the grass entirely for several weeks. Generally, in this county, the sheep live on the blue-grass the whole winter without other food. *Lawrence, Mo.:* Poor; too cold for them without shelter. *Logan, Ohio.:* Generally good; cases of neglect of care and feeding the exceptions. *Champaign, Ohio:* Average; when properly fed, above; cold dry weather does not affect well-fed sheep unfavorably. *Stanislaus, Cal.:* Poor, from want of food and shelter from the cold winds and storms. *San Diego, Cal.:* Suffered, and 20 to 25 per cent. of all flocks died for want of pasture.

LOSSES OF CATTLE AND SHEEP.

But 178 counties make return of greater losses than usual; 315 estimate an average proportion, and 502 indicate a reduction of the usual percentage of loss. The whole number reporting was 995. This is a favorable showing. Only two counties in New England make the loss greater than usual. In one county in Pennsylvania it is declared to be "less than for the last ten years;" and in another (Warren) "farmers are learning that it pays to feed and care for their cattle and sheep, and that it does *not* pay to get their stock nearly or quite through the win-

ter and then let them die." While losses in the South were generally lighter this year, some counties report a large increment of loss, and in the State of Texas losses were heavier in 33 counties reported, less in 8, and average in 10 counties. In some of the counties losses were heavy—in Gonzales the estimate of cattle is 20,000 head—from the fact that the range is overstocked and the grass destroyed; in Bosque the greatest mortality ever known—at least one-half of the cattle—for want of water and grass, in some cases herds being obliged to feed five or six miles from water, nearer streams having dried up.

A few instances in different States will illustrate the extent of loss from mortality of farm-stock:

Maury, Tenn.: Much greater than any winter since 1865. Half the lambs dropped at this time have died, and 75 per cent. of the ewes have lambed. *Martin, Minn.:* Of cattle, average; about one-tenth of the sheep were smothered in the great storm in January. *Brown, Minn.:* Four times as many as in previous winters lost in the snow-storm. *Buena Vista, Iowa:* A large number of cattle have been lost by being caught in corn-fields in hard storms. *Howard, Iowa:* Of cattle, greater; quite a number perished in the great storm of January. *Lincoln, Kans.:* Last winter 33 per cent. of the cattle died and about 3 per cent. of the sheep; this year no cattle, and not half of 1 per cent. of sheep. *Woodson, Kans.:* Of cattle 60 per cent. less; of sheep 40 per cent. less; early dropped lambs (which ought to be avoided) constitute the principal loss of this spring. *Tooele, Utah:* One hundred per cent. greater; all the early lambs died, also most of the oldest ewes; the cattle did not fare better; several made high wages by skinning dead cattle on the range.

DISEASES OF FARM-ANIMALS.

The diseases of farm-animals in 1873 were of the usual character and not attended with extraordinary mortality, the most noticeable exception being influenza among horses, or epizooty, which commenced its manifestations in the latter part of 1872, and continued in the more western States and Territories into 1873.

Horse diseases.—The result of an investigation made of the horse influenza in the spring of 1873 was published in the monthly, from which the following extract, showing the local dates of first appearance, rate of progress westward, and time of continuance, is made for the purpose of future reference:

It first attracted general notice, through the newspapers, about the last of September, and was represented as having invaded the United States from Canada, where it had prevailed for some time previous. Our reports, however, show an earlier date of attack at isolated points in this country. The earliest visitation—about the last of August—appears to have been in Mercer County, on the western border of Pennsylvania, the third county in southward succession from Lake Erie. It appeared a little later—September 1—in Hillsborough and Merrimack, two of the most southern counties of New Hampshire. Our correspondent in Forsyth, one of the mountainous counties of North Carolina, assigns September 5 as the date of its outbreak in that locality. About the middle of September it was noticed simultaneously in Cape May and Hunterdon Counties, New Jersey; Northampton and McKean Counties, Pennsylvania; Cecil and Talbot Counties on the eastern shore of Maryland; Madison, Greenville, Rappahannock and Prince George Counties, Virginia; Moultrie County, Illinois; Breckinridge County, Kentucky, and Mineral County, West Virginia. Cape May is the most southerly county in New Jersey; it is remarkable, in this connection, that the disease was not noticed in Atlantic, the next county to the north, till December 1. Its general progress was southward and westward, yet not without some vagaries of movement. In Ohio, for instance, it appeared about October 1; in Geauga, in the extreme northeast, and in Hamilton, in the extreme southwest, while in the majority of the counties of the State its advent is reported as late in November, and in one—Williams, in the extreme northwest—so late as December 20. In the other States north of the Ohio River its first symptoms were variously noted from the middle of October till Christmas. West of the Mississippi it appeared to radiate about equally in different directions. At our latest advices it had just appeared in Lewis and Clarke County, Montana, and in Ada County, Idaho; in both localities its introduction was charged upon overland stage companies. It appeared in El Paso County, Colorado, as early as December 1; but Conejos, Huerfano, Douglas, and Weld report its appearance in the earlier part of

January. Still later it appeared in Santa Fé County, New Mexico, and in Sevier, Weber, Tooele, Rich, San Pete, Cache, and Davis Counties, Utah. Its presence was felt in Plumas County, California, as early as December 1; in Alameda, December 15; Santa Clara, January 31; San Joaquin, February 14; Alpine, March 5; Los Angeles, March 18. It was expected in other counties in California, Oregon, and Washington, but in the latter it had not appeared.

The average dates of the first appearance of the disease in each of the States were as follows: Maine, October 19; New Hempshire, October 20; Vermont, October 18; Massachusetts, November 7; Rhode Island, November 1; Connecticut, October 29; New York, October 19; New Jersey, October 20; Pennsylvania, October 24; Delaware, October 28; Maryland, October 22; Virginia, November 5; North Carolina, November 17; South Carolina, November 19; Georgia, November 23; Florida, November 17; Alabama, December 1; Mississippi, November 28; Louisiana, December 5; Texas, December 17; Arkansas, November 19; Tennessee, November 21; West Virginia, November 19; Kentucky, November 18; Ohio, November 9; Michigan, November 2; Indiana, November 19; Illinois, November 17; Wisconsin, November 15; Minnesota, December 3; Iowa, November 28; Missouri, December 7; Kansas, December 10; Nebraska, December 14.

The average continuance of the disease in individual cases varied considerably, the extreme range being between five days and forty-five days, the minimum being in Franklin County, North Carolina. The averages were somewhat greater east of the Alleghany Mountains. In Maine, the county averages ranged from 10 to 25 days, the State average being 16. New Hampshire reports a longer continuance of the disease, the counties ranging from 21 to 42 days, and the State averaging 35. In the other New England States the period was shorter; Vermont averaging 20; Massachusetts 20; Connecticut 23. In the Middle States the county averages ranged from 9 to 42 days, the shortest period being reported in Cattaraugus, New York. The State of New York averaged 20 days; New Jersey, 25; Pennsylvania, 23. The Atlantic Coast States varied between 5 days (in Franklin County, North Carolina) and 42 days. The State averages were as follows: Maryland, 26 days; Virginia, 21; North Carolina, 21; South Carolina, 26; Georgia, 21. The Gulf States varied between 8 days and 42 days, the shorter period being reported in Lauderdale and Limestone Counties, Alabama. Florida averaged 19 days; Alabama, 20; Mississippi, 21; Louisiana, 22; Texas, 21. The inland Southern States ranged from 10 to 45 days, the minimum being in Pocahontas County, West Virginia, and the maximum in Davies County, Kentucky. Arkansas averaged 19 days; Tennessee, 21; West Virginia, 18; Kentucky, 20. North of the Ohio River the county averages ranged from 10 to 42 days. Ohio averaged 20 days; Michigan, 23; Indiana, 23; Illinois, 23; Wisconsin, 22. West of the Mississippi the disease prevailed from 10 to 35 days; Minnesota averaged 24 days; Iowa, 23; Missouri, 19; Kansas, 21; Nebraska, 22. The reports from the Territories were too few for a reliable average. In California one county, San Joaquin, averaged 12 days.

The pathology and treatment of the disease were fully treated by Professor Law in the last annual report of the Department, but the statistics of mortality may be properly given here:

The fatality was small considering the large number of animals affected by the disease. In Maine five counties report losses ranging from 1 to 6 per cent. of the animals attacked; five others report a few cases. In New Hampshire, Vermont, and Connecticut no county lost over 2½ per cent. In Massachusetts and Rhode Island the loss in one county of each reached 10 per cent. The maximum in New York and New Jersey was 5 per cent.; in Pennsylvania, 3 per cent.; in Maryland, 3 per cent.; Virginia, 6½ per cent.; North Carolina, 1 per cent.; South Carolina, 2 per cent.; Georgia, 5 per cent.; Florida, 3 per cent.; Alabama, 2 per cent.; Mississippi, 5 per cent.; Louisiana, 2 per cent.; Texas, 15 per cent., (in Kaufman County;) Arkansas, 5 per cent.; Tennessee, 4 per cent.; West Virginia, 5 per cent.; Kentucky, 4 per cent.; Ohio, 5 per cent.; Michigan, 2 per cent.; Indiana, 2 per cent.; Illinois, 5 per cent.; Wisconsin, 1 per cent.; Minnesota, 2½ per cent.; Iowa, 3 per cent.; Missouri, 1 per cent.; Kansas, 1 per cent.; Nebraska, 1 per cent. The higher maxima, however, generally indicate isolated cases. In West Virginia, for instance, most of the counties reported 1 per cent. or less, while in several there were no deaths. One county in Florida (Volusia) reports no cases.

The mortality of asses and mules was especially remarkable in portions of the South and West. In Navarro and Collin Counties, Texas, 50 per cent. of the jacks and jennets died; in Cherokee, 20 per cent.; in Limestone the disease was very fatal. In Madison County, Arkansas, nine-tenths of asses and mules died. Tennessee reports a heavy mortality; Hamilton County, eight-fourteenths; Maury, 20 per cent.; Lincoln, 25 per cent.; Robertson, 50 per cent.; Monroe, 25 per cent.; Davidson, 67 per cent.; Sumner, 33 per cent.; Giles, 67 per cent.; Knox and Granger, all. A similar mortality of the asinine tribe is reported in Christian, Owsley, Taylor, and Lane Counties, Kentucky. One correspondent thinks that the majority of the jacks in Kentucky and

Tennessee died. Hardly a jack or a jennet was left in Montgomery County, Ohio. A heavy loss of this class of animals was also felt in Indiana, Illinois, and Missouri. In several counties in each of these States the losses included half the cases of disease, and in some cases half the number of animals in the county. In Shawnee County, Kansas, the only victims of the malady were jacks.

The mortality in horses was to a large extent caused by their being worked before they had entirely recovered from disease. In several counties it is expressly stated that no animals died except from overwork. Quite a number of counties report no deaths among their animals; of this class of counties there is in Massachusetts, 1; New York, 2; New Jersey, 2; Pennsylvania, 2; Maryland, 1; Virginia, 13; North Carolina, 17; South Carolina, 2; Georgia, 15; Florida, 2; Alabama, 5; Mississippi, 8; Louisiana, 4; Texas, 7; Arkansas, 3; Tennessee, 10; West Virginia, 6; Kentucky, 7; Ohio, 8; Michigan, 2; Indiana, 12; Illinois, 5; Wisconsin, 6; Minnesota, 5; Iowa, 5; Missouri, 10; Kansas, 6; Nebraska, 4.

The condition of animals after recovery, or at least after the removal of active symptoms of the disease, was quite various. In some counties it is reported that the general health and spirit of the affected animals were greatly improved, a result attributed to rest, good food, and extra care expended upon them. In other cases they were found to be fully up to their former *status* of flesh and strength. In others, however, a deterioration was observed, which it was feared would, in some animals, prove permanent. In many counties this deterioration is ascribed to neglect, hard usage, and premature working, but in others it cannot thus be accounted for.

THE WINTER OF 1873-'74.

The month of November was unusually cold and stormy throughout the Northwest, requiring early feeding, for which abundant provision existed, except in limited areas affected by drought. In Texas unusual exemption from northers favored comparatively high condition of farm-stock, obviating the suffering sometimes resulting from exposure, and even permitting, in some localities, positive improvement during the winter. On the Pacific coast the winter has been one of the severest and most protracted ever known. The reported losses are very heavy, amounting to nearly 10,000 head in Humboldt County, Cal., or one-third of the entire stock of cattle. Mendocino lost one-fifth, and other counties in large proportion. East of the Rocky Mountains the weather was milder than usual, feed was in fair supply, and where there was a scarcity of hay the deficiency was made good by a large provision of rough forage. The humidity of the winter has been unfavorable to exposed herds. For many years there has not been a season to compare in mildness with the present, throughout all the Southern States. Unsheltered and uncared for as the stock in that region is, there was little loss or depreciation. Only a small portion of the data received indicated poor condition. The returns have been equally favorable as to sheep, except as to Washington Territory, Oregon, and California, where the losses were heavy for the reason stated above.

The diseases of the latter part of the year were generally light, with few unusual forms, and no wide-spread fatality. Many horses, afflicted with the prevalent influenza of the previous winter, were left with various chronic forms of disease, to which they ultimately succumbed. As usual, diseases among swine resulted in the largest proportion of loss.

PRICES OF FARM-ANIMALS.

Our record of actual prices of domestic animals, in home markets, may be relied upon as accurate, the average from each State being made from a census of a large proportion of the stock of the State. The State valuations, for purposes of taxation, are utterly worthless as indexes of real value, in no case representing the cash value, and in no two States representing the same proportion of the cash valuation. The following averages for the whole country, for the past seven years, show the course of prices, in their increase in the period immediately following

the war, and their subsequent decline, which came earlier to sheep than to cattle, for well-known reasons:

Animals.	1874.	1873.	1872.	1871.	1870.	1869.	1868.
Horses	$71 45	$74 36	$73 37	$78 51	$81 38	$84 16	$75 16
Mules	89 22	95 24	94 82	101 52	109 01	106 74	77 61
Oxen and other cattle	19 15	20 06	19 61	22 81	22 54	25 12	20 86
Milch-cows	27 99	29 62	31 97	37 33	39 12	39 11	36 78
Sheep	2 61	2 96	2 80	2 32	2 28	2 17	2 52
Hogs	4 36	4 09	4 36	6 19	6 99	6 26	4 55

Horses are now (January 1, 1874) lower in price than at any period since 1868. Mules have been falling in price since 1869. Cattle are lower than at any date within a period of seven years, being highest in 1869, falling considerably before January, 1870, remaining stationary for a year or more, but receding further in 1872, then advancing in 1873, but losing all the advance during the panic of the latter part of this year. The decline from the maximum average amounts to about 25 per cent. while the fall in the price of horses is only 17 per cent. in six years. The price of sheep was lowest in January, 1869, averaging $2.17, at the date of greatest depression in sheep husbandry and of unprecedented slaughter for pelts and tallow, since which date the rise has been gradual but continuous until the present winter, which witnesses, with almost all other farm-products, a decline, which will probably be only temporary. Swine bear the same average as in January, 1872, which is 6 per cent. higher than last year, and the scarcity of corn would have carried the figure still higher but for the effect of the monetary revulsion.

The following tables are compiled from the annual State averages of prices of the several kinds of farm-stock as returned on the 1st day of January of the year named:

Prices of horses.

States.	1874.	1873.	1872.	1871.	1870.	1869.
Maine	$96 34	$89 61	$79 04	$86 38	$100 94	$120 15
New Hampshire	89 21	87 01	79 04	89 29	83 86	89 94
Vermont	85 20	93 29	95 08	97 49	82 99	91 78
Massachusetts	119 92	108 26	113 33	129 89	122 60	130 24
Rhode Island	109 45	100 30	91 86	98 19	98 62	102 38
Connecticut	103 57	98 89	96 64	102 85	115 17	122 00
New York	95 15	102 58	99 04	102 49	104 12	104 78
New Jersey	132 08	127 21	129 10	130 00	134 94	143 03
Pennsylvania	99 43	102 46	97 18	106 92	104 41	106 86
Delaware	87 16	90 41	75 82	89 99	94 04	99 16
Maryland	87 03	88 91	91 14	90 52	92 20	104 93
Virginia	75 92	81 57	78 18	84 93	89 58	80 60
North Carolina	84 59	90 13	90 54	90 41	92 74	91 90
South Carolina	97 51	100 82	94 86	101 97	117 75	112 97
Georgia	95 07	104 80	97 33	109 15	119 57	115 12
Florida	94 36	95 99	93 52	121 36	123 38	108 99
Alabama	74 60	92 22	87 14	99 34	107 18	89 32
Mississippi	87 00	93 85	91 71	104 22	110 29	112 96
Louisiana	86 22	100 79	85 38	91 29	116 48	119 28
Texas	38 10	37 41	33 31	32 29	37 53	31 11
Arkansas	73 12	78 38	78 81	73 98	87 87	71 64
Tennessee	77 51	79 88	82 73	84 48	90 41	93 86
West Virginia	65 49	66 90	72 32	81 83	78 84	77 72
Kentucky	63 24	67 88	69 91	75 05	80 40	73 85
Ohio	79 36	79 76	78 15	79 48	80 99	80 85
Michigan	77 41	80 40	77 80	79 69	83 23	88 36
Indiana	65 35	67 78	66 78	72 38	75 04	73 12
Illinois	62 34	66 31	65 81	70 26	70 94	73 23
Wisconsin	72 30	77 66	76 19	79 87	83 33	91 09
Minnesota	72 58	78 82	76 55	79 13	90 82	91 18
Iowa	66 34	63 85	66 01	71 15	81 01	90 47
Missouri	48 48	51 49	53 14	63 61	64 14	63 97
Kansas	52 91	53 10	58 91	73 15	73 31	72 72
Nebraska	74 84	73 14	72 02	83 05	95 29	93 73
California	47 48	44 15	43 59	50 26	36 50	52 71
Oregon	42 64	50 73	47 68	54 29	53 34	......
Nevada	38 10	47 50	44 40	58 66	......	......

Prices of mules.

States.	1874.	1873.	1872.	1871.	1870.	1869.
Maine	......	......	......	......	......	......
New Hampshire	......	......	......	......	......	......
Vermont	......	......	......	......	......	......
Massachusetts	......	......	......	......	......	......
Rhode Island	......	......	......	......	......	......
Connecticut	......	......	......	......	......	......
New York	$123 18	$130 06	$119 87	$124 23	$139 82	$132 98
New Jersey	146 65	144 81	149 95	140 00	152 87	167 88
Pennsylvania	127 08	128 32	130 21	132 51	130 43	136 08
Delaware	111 21	115 31	113 99	130 99	128 37	141 65
Maryland	120 44	124 62	122 97	123 86	123 18	143 12
Virginia	103 83	109 30	110 42	108 93	114 33	110 72
North Carolina	102 88	112 02	111 02	114 43	116 70	112 77
South Carolina	112 32	112 25	112 69	108 25	126 01	130 12
Georgia	113 85	126 59	121 99	31 64	151 58	145 11
Florida	118 38	127 05	125 26	99 66	141 69	162 32
Alabama	91 35	102 08	105 83	116 93	133 38	111 25
Mississippi	106 90	113 81	113 74	127 74	141 30	139 38
Louisiana	110 11	121 59	116 55	134 79	140 70	138 50
Texas	56 87	56 50	48 34	52 30	51 73	48 91
Arkansas	89 69	94 88	97 36	93 51	106 57	88 56
Tennessee	90 84	93 27	95 10	105 51	112 01	110 39
West Virginia	80 14	84 27	85 91	92 08	91 96	92 03
Kentucky	70 81	77 98	78 40	82 73	89 31	89 90
Ohio	81 05	82 37	83 44	83 36	86 44	89 74
Michigan	82 17	90 83	87 98	93 08	94 45	98 64
Indiana	68 31	72 58	68 66	74 33	82 25	77 69
Illinois	76 23	78 73	80 63	85 18	85 63	93 60
Wisconsin	90 16	100 86	89 99	106 55	113 83	115 75
Minnesota	81 00	88 73	88 39	104 15	105 53	115 71
Iowa	73 98	72 93	74 50	83 24	89 39	100 80
Missouri	68 30	70 96	73 33	83 43	87 20	83 75
Kansas	66 83	68 07	76 52	92 14	86 05	80 81
Nebraska	103 22	103 89	97 74	119 35	121 78	140 91
California	63 74	71 06	59 76	65 64	66 66	73 98
Oregon	46 84	50 49	54 49	50 82	......	......
Nevada	65 75	65 00	56 66	75 00	......	......

Prices of oxen and other cattle.

States.	1874.	1873.	1872.	1871.	1870.	1869.
Maine	$39 14	$38 64	$21 29	$36 98	$43 30	$50 70
New Hampshire	37 55	38 41	30 68	36 62	44 26	47 76
Vermont	32 88	38 62	31 70	42 80	38 11	42 47
Massachusetts	39 18	39 86	35 21	41 66	49 48	54 41
Rhode Island	50 01	52 72	40 38	51 91	61 14	72 93
Connecticut	44 10	40 66	38 43	45 57	61 51	62 31
New York	28 88	34 05	34 10	42 27	45 91	46 67
New Jersey	33 86	32 43	37 75	45 06	47 79	53 59
Pennsylvania	26 49	30 13	31 01	41 41	36 25	36 59
Delaware	22 41	28 84	18 16	25 70	28 56	30 44
Maryland	22 87	23 66	21 84	27 21	31 07	31 44
Virginia	17 20	16 87	17 21	21 34	23 42	20 39
North Carolina	9 38	9 81	10 45	10 68	11 15	11 11
South Carolina	11 38	13 93	13 37	12 08	11 58	14 41
Georgia	9 84	10 99	10 23	10 80	11 38	13 83
Florida	9 23	8 93	8 20	8 17	8 22	9 34
Alabama	11 41	13 07	11 39	12 34	13 74	12 73
Mississippi	12 29	12 70	13 52	14 59	14 34	14 26
Louisiana	10 28	12 38	12 70	15 62	11 34	10 70
Texas	8 09	7 51	8 10	7 37	6 10	5 78
Arkansas	11 37	11 77	12 21	11 82	12 02	11 24
Tennessee	14 22	13 67	13 88	14 77	17 26	17 14
West Virginia	22 84	21 66	24 78	29 81	28 12	29 49
Kentucky	22 55	24 02	25 99	31 10	30 08	31 03
Ohio	26 30	27 71	29 50	35 34	33 99	34 04
Michigan	25 39	28 27	28 45	31 65	32 77	34 78
Indiana	20 67	23 08	22 26	26 16	28 07	26 66
Illinois	24 03	23 89	22 58	26 02	25 10	27 35
Wisconsin	21 96	23 63	26 56	26 86	26 09	27 93
Minnesota	22 01	21 44	22 20	23 75	28 29	25 68
Iowa	22 18	23 41	21 41	24 05	25 78	27 14
Missouri	17 44	18 30	17 94	24 46	22 26	21 70
Kansas	18 90	20 46	20 97	23 84	27 35	26 87
Nebraska	23 62	25 14	24 38	29 95	29 77	29 84
California	19 52	23 71	23 80	26 92	26 22	27 80
Oregon	16 16	19 43	23 23	21 69	23 00	......
Nevada	23 22	23 00	25 26	30 60	......	......

Prices of cows.

States.	1874.	1873.	1872.	1871.	1870.	1869.
Maine	$37 50	$36 56	$25 13	$36 37	$39 80	$51 38
New Hampshire	38 00	36 00	33 33	37 50	43 66	55 00
Vermont	35 50	35 33	36 62	47 50	50 33	50 07
Massachusetts	45 00	41 16	39 87	59 16	57 00	67 50
Rhode Island	41 66	42 50	41 33	44 25	55 00	60 00
Connecticut	42 50	39 50	43 10	53 50	60 14	66 66
New York	30 50	34 00	39 53	48 51	54 11	54 14
New Jersey	45 75	44 16	54 80	61 38	63 93	70 50
Pennsylvania	33 25	35 50	39 16	46 67	46 83	47 11
Delaware	33 50	33 00	32 00	35 00	40 66	40 00
Maryland	31 60	30 77	32 25	39 09	43 18	45 44
Virginia	22 00	23 69	24 93	29 09	30 04	28 76
North Carolina	15 50	17 00	21 89	22 57	20 55	20 71
South Carolina	21 88	25 50	23 65	23 22	22 63	23 85
Georgia	18 54	21 93	20 81	21 61	22 48	22 36
Florida	14 32	15 11	14 03	15 83	16 16	15 00
Alabama	19 50	19 85	18 83	24 50	23 46	21 33
Mississippi	21 58	23 12	23 73	25 34	26 34	22 91
Louisiana	20 70	26 50	25 00	24 62	30 14	20 28
Texas	15 25	13 50	14 12	12 83	10 67	9 12
Arkansas	17 75	20 43	21 33	22 14	22 60	21 75
Tennessee	21 86	21 54	22 83	23 57	29 07	28 04
West Virginia	27 50	29 80	33 85	34 73	33 60	34 23
Kentucky	26 46	30 13	32 51	38 14	38 51	36 46
Ohio	29 57	32 18	37 36	45 09	44 77	43 00
Michigan	30 50	33 32	36 86	41 15	42 94	44 62
Indiana	29 62	30 73	33 57	38 50	40 41	36 48
Illinois	30 03	30 45	33 77	37 68	37 02	38 11
Wisconsin	26 28	28 00	29 29	35 26	35 78	37 25
Minnesota	26 27	30 08	29 70	32 91	36 11	38 53
Iowa	26 50	28 16	28 49	34 31	34 91	36 13
Missouri	22 45	23 26	25 85	31 92	32 32	31 21
Kansas	25 30	28 94	30 77	38 46	37 42	30 67
Nebraska	29 50	30 96	35 00	41 81	39 91	41 00
California	35 28	43 44	44 66	46 36	47 62	50 31
Oregon	24 42	32 95	37 90	32 25	32 00	......
Nevada	37 50	39 00	40 00	50 00	....	......

Prices of sheep.

States.	1874.	1873.	1872.	1871.	1870.	1869.
Maine	$3 79	$4 29	$3 08	$2 73	$2 79	$3 07
New Hampshire	4 00	4 23	2 93	2 35	2 59	2 45
Vermont	3 59	4 03	4 26	2 62	2 89	2 67
Massachusetts	4 05	3 87	3 51	3 26	3 28	3 37
Rhode Island	4 30	5 36	3 62	3 71	4 32	3 93
Connecticut	4 39	4 93	4 28	4 07	4 42	4 72
New York	3 36	4 30	4 02	3 14	3 04	3 05
New Jersey	5 14	4 96	5 08	4 81	4 41	4 61
Pennsylvania	3 20	3 68	3 41	3 10	2 86	2 62
Delaware	3 75	4 12	4 00	3 75	4 37	3 50
Maryland	4 42	4 17	4 12	3 86	4 09	4 16
Virginia	2 90	3 04	2 70	2 37	2 58	2 40
North Carolina	1 55	1 61	1 57	1 63	1 66	1 71
South Carolina	1 85	2 05	1 91	1 95	1 73	1 77
Georgia	1 59	1 62	1 53	1 65	1 68	1 63
Florida	1 93	2 03	1 73	1 31	2 00	2 80
Alabama	1 82	1 93	1 82	1 77	1 59	1 37
Mississippi	1 93	1 85	1 95	2 00	1 77	1 90
Louisiana	1 74	2 00	2 14	2 18	2 00	1 54
Texas	2 02	1 80	1 52	1 40	1 70	1 38
Arkansas	1 96	2 19	2 29	2 32	2 00	2 71
Tennessee	2 09	1 93	1 74	1 66	1 82	2 04
West Virginia	2 52	2 67	2 39	2 11	1 89	1 67
Kentucky	2 56	2 86	2 61	2 53	2 75	2 56
Ohio	2 82	3 02	3 11	2 26	1 98	1 70
Michigan	2 47	2 89	2 86	2 23	1 93	1 87
Indiana	2 65	2 83	2 54	1 82	1 73	1 63
Illinois	2 53	3 20	2 66	1 98	1 65	1 86
Wisconsin	2 64	2 83	2 66	2 44	2 13	2 38
Minnesota	2 81	3 08	2 62	2 22	2 42	2 32
Iowa	2 38	2 42	2 20	1 71	1 57	1 80
Missouri	1 90	2 05	1 97	1 61	1 70	1 79
Kansas	2 00	2 45	2 34	2 53	2 11	2 62
Nebraska	2 22	2 81	2 40	2 24	2 50	2 71
California	2 31	2 97	2 78	2 59	2 56	2 53
Oregon	2 50	2 76	2 45	1 90	1 90	......
Nevada	2 75	3 00	3 75	4 31	....	......

Prices of swine.

States.	1874.	1873.	1872.	1871.	1870.	1869.
Maine	$11 02	$9 90	$9 99	$9 87	$16 46	$13 94
New Hampshire	12 85	11 75	11 68	17 78	18 72	18 56
Vermont	9 59	9 56	9 52	17 00	16 62	14 31
Massachusetts	12 94	13 47	11 85	15 55	19 35	15 32
Rhode Island	13 72	12 00	10 49	14 62	15 66	14 74
Connecticut	13 36	13 13	11 63	18 75	17 65	16 75
New York	7 73	8 31	7 34	11 09	12 88	12 02
New Jersey	10 29	9 25	9 66	15 45	16 07	14 93
Pennsylvania	6 62	8 12	6 67	10 72	12 61	10 59
Delaware	6 81	5 75	5 00	6 25	9 12	8 25
Maryland	6 07	6 30	5 11	7 76	8 80	8 44
Virginia	3 51	3 67	3 58	5 60	5 42	4 39
North Carolina	2 86	3 08	3 00	4 15	4 78	4 33
South Carolina	3 94	4 66	3 30	4 69	4 26	4 06
Georgia	2 91	3 00	3 32	4 64	3 61	3 75
Florida	2 44	2 70	2 59	2 75	3 12	3 16
Alabama	2 88	3 10	3 66	4 30	5 40	3 87
Mississippi	3 49	2 98	3 45	4 40	5 02	4 94
Louisiana	3 21	3 93	4 51	4 30	3 04	3 65
Texas	2 86	2 90	2 69	2 76	2 67	2 15
Arkansas	2 94	2 58	3 82	3 28	5 32	4 20
Tennessee	3 09	3 38	3 32	4 49	4 81	5 17
West Virginia	3 68	3 58	3 65	4 80	5 26	4 40
Kentucky	3 27	3 19	3 34	4 81	5 91	5 93
Ohio	5 54	4 57	5 21	7 89	9 40	8 63
Michigan	4 79	4 52	4 67	7 37	8 19	7 06
Indiana	4 40	3 61	4 93	6 04	7 91	6 57
Illinois	5 21	4 30	4 70	7 52	8 15	8 42
Wisconsin	4 41	4 67	4 41	7 93	8 39	7 37
Minnesota	4 79	5 03	5 19	6 61	7 36	7 38
Iowa	4 82	4 47	4 76	7 15	8 07	8 11
Missouri	3 30	2 40	3 25	4 34	5 79	3 78
Kansas	5 18	5 30	5 51	8 68	7 05	6 82
Nebraska	4 51	5 51	5 72	8 58	8 05	6 39
California	6 16	6 11	5 05	5 94	4 47	5 52
Oregon	2 35	4 16	3 79	2 51	3 00	....
Nevada	8 50	7 50	7 00	7 49	....	....

Table showing the estimated total number and total value of each kind of live-stock, and the average price in January, 1874.

States.	Horses.			Mules.			Oxen and other cattle.		
	Number.	Average price.	Value.	Number.	Average price.	Value.	Number.	Average price.	Value.
Maine	78,000	$96 34	$7,514,520	....	....	....	198,000	$39 14	$7,749,720
New Hampshire	47,500	89 21	4,237,475	....	....	....	118,100	37 55	4,434,655
Vermont	71,000	65 28	6,049,200	....	....	....	128,000	32 88	4,208,640
Massachusetts	102,800	119 92	12,327,776	....	....	....	122,600	39 18	4,803,468
Rhode Island	14,700	109 45	1,608,915	....	....	....	16,000	50 01	800,160
Connecticut	49,700	103 57	5,147,429	....	....	....	107,800	44 10	4,753,980
New York	659,300	95 15	62,732,395	18,900	$123 18	$2,328,102	683,600	28 88	19,742,368
New Jersey	115,700	132 08	15,281,656	15,000	146 65	2,199,750	83,900	33 86	2,840,854
Pennsylvania	557,000	99 43	55,382,510	24,900	127 08	3,164,292	722,600	26 49	19,141,674
Delaware	20,000	87 16	1,743,200	4,000	111 21	444,840	31,700	22 41	710,397
Maryland	104,500	87 03	9,094,635	10,700	120 44	1,288,708	125,600	22 87	2,872,472
Virginia	189,300	75 92	14,371,656	29,600	103 83	3,073,368	405,700	17 20	6,978,040
North Carolina	131,800	84 59	11,148,962	48,400	102 88	4,979,392	316,500	9 38	2,968,770
South Carolina	56,400	97 51	5,499,564	45,200	112 32	5,076,864	184,900	11 38	2,104,162
Georgia	116,100	95 07	11,037,627	92,700	113 85	10,553,895	405,300	9 84	3,988,152
Florida	16,600	94 36	1,566,376	10,000	118 38	1,183,800	383,600	9 23	3,540,628
Alabama	106,600	74 60	7,952,360	102,500	91 35	9,363,375	334,100	11 41	3,812,081
Mississippi	88,300	87 00	7,682,100	99,100	106 90	10,593,790	329,800	12 29	4,053,242
Louisiana	75,700	86 22	6,526,854	78,400	110 11	8,632,624	173,900	10 28	1,787,692
Texas	699,100	38 10	26,635,710	97,700	56 87	5,556,199	2,415,800	8 09	19,543,822
Arkansas	162,500	73 12	11,882,000	83,600	89 69	7,498,084	256,600	11 37	2,917,542
Tennessee	302,900	77 51	23,477,779	103,200	90 84	9,374,688	355,100	14 22	5,049,522
West Virginia	104,600	65 49	6,850,254	2,390	80 14	191,534	242,500	22 84	5,538,700
Kentucky	343,900	63 24	21,748,236	83,600	70 81	5,919,716	380,400	22 55	8,578,020
Ohio	738,600	79 36	58,615,296	22,300	81 05	1,807,415	882,990	26 30	23,220,270
Michigan	288,300	77 41	22,317,303	3,900	82 17	320,463	468,100	25 39	11,885,059
Indiana	649,500	65 35	42,444,825	58,500	68 31	3,996,135	780,300	20 67	16,128,801
Illinois	1,059,800	62 34	66,067,932	96,800	76 23	7,379,064	1,273,580	24 03	30,602,205
Wisconsin	335,300	72 30	24,242,190	4,800	90 16	432,768	444,800	21 96	9,767,808
Minnesota	152,200	72 58	11,046,676	3,060	81 00	247,860	282,700	22 01	6,222,227
Iowa	647,000	66 34	42,921,980	35,300	73 98	2,611,494	852,800	22 18	18,915,104
Missouri	543,000	48 48	26,324,640	89,200	68 30	6,092,360	806,300	17 44	14,061,872
Kansas	220,700	52 91	11,677,237	19,100	66 83	1,276,453	507,200	18 90	9,586,080
Nebraska	56,700	74 84	4,243,428	4,400	103 22	454,168	87,800	23 62	2,073,836
California	232,500	47 48	11,039,100	23,000	63 74	1,466,020	428,900	19 52	8,372,128
Oregon	86,400	42 64	3,684,096	3,700	46 84	173,308	123,700	16 16	1,998,992
Nevada	10,100	38 10	384,810	1,000	65 75	65,750	44,000	23 22	1,021,680
The Territories	99,700	44 32	4,418,704	24,400	71 95	1,755,580	713,000	19 46	13,874,980
Total	9,333,800	....	666,927,406	1,339,350	....	119,501,859	16,218,100	....	310,649,803
Grand average of prices	....	71 45	....	....	89 22	....	....	19 15	....

Table showing the estimated total number and total value of each kind of live-stock, and the average price in January, 1874—Continued.

States.	MILCH-COWS.			SHEEP.			HOGS.		
	Number.	Average price.	Value.	Number.	Average price.	Value.	Number.	Average price.	Value.
Maine	153, 500	$37 50	$5, 756, 250	446, 900	$3 79	$1, 693, 751	60, 800	$11 02	$670, 016
New Hampshire	92, 700	38 00	3, 522, 600	237, 700	4 00	950, 800	37, 800	12 85	485, 730
Vermont	195, 700	35 50	6, 947, 350	543, 600	3 59	1, 951, 524	53, 500	9 59	513, 065
Massachusetts	136, 300	45 00	6, 133, 500	76, 300	4 05	309, 015	78, 000	12 94	1, 009, 320
Rhode Island	20, 400	41 66	849, 864	25, 600	4 30	110, 080	17, 100	13 72	234, 612
Connecticut	106, 800	42 50	4, 539, 000	85, 600	4 39	375, 784	61, 700	13 36	824, 312
New York	1, 410, 600	30 50	43, 023, 300	2, 037, 200	3 36	6, 844, 992	651, 500	7 73	5, 036, 095
New Jersey	147, 900	45 75	6, 766, 425	125, 900	5 14	647, 126	163, 000	10 29	1, 677, 270
Pennsylvania	812, 600	33 25	27, 018, 950	1, 674, 000	3 20	5, 356, 800	1, 034, 400	6 62	6, 847, 728
Delaware	24, 900	33 50	834, 150	23, 200	3 75	87, 000	48, 200	6 81	328, 242
Maryland	96, 900	31 60	3, 062, 040	133, 200	4 42	588, 744	256, 200	6 07	1, 555, 134
Virginia	234, 000	22 00	5, 148, 000	367, 500	2 90	1, 065, 750	753, 100	3 51	2, 643, 381
North Carolina	199, 100	15 50	3, 086, 050	278, 500	1 55	431, 675	823, 300	2 86	2, 354, 638
South Carolina	157, 800	21 88	3, 452, 664	153, 400	1 85	283, 790	322, 600	3 94	1, 271, 044
Georgia	257, 400	18 54	4, 772, 196	235, 700	1 59	374, 763	1, 497, 000	2 91	4, 356, 270
Florida	69, 000	14 32	988, 080	31, 900	1 93	61, 567	183, 400	2 44	447, 496
Alabama	173, 400	19 50	3, 381, 300	189, 900	1 82	345, 618	990, 100	2 88	2, 851, 488
Mississippi	180, 100	21 58	3, 886, 558	153, 600	1 93	296, 448	819, 100	3 49	2, 858, 659
Louisiana	90, 700	20 70	1, 877, 490	64, 600	1 74	112, 404	247, 100	3 21	793, 191
Texas	526, 500	15 25	8, 029, 125	1, 338, 700	2 02	2, 704, 174	1, 147, 400	2 86	3, 281, 564
Arkansas	151, 800	17 75	2, 694, 450	176, 300	1 96	345, 548	960, 500	2 94	2, 823, 870
Tennessee	247, 700	21 86	5, 414, 722	350, 000	2 09	731, 500	1, 420, 900	3 09	4, 390, 581
West Virginia	124, 300	27 50	3, 418, 250	555, 900	2 52	1, 400, 868	334, 000	3 68	1, 229, 120
Kentucky	229, 400	26 46	6, 069, 924	808, 100	2 56	2, 068, 736	2, 008, 000	3 27	6, 566, 160
Ohio	778, 500	29 57	23, 020, 245	4, 639, 000	2 82	13, 081, 980	2, 017, 400	5 54	11, 176, 396
Michigan	350, 600	30 50	10, 693, 300	3, 486, 300	2 47	8, 611, 161	510, 800	4 79	2, 446, 732
Indiana	448, 400	29 62	13, 281, 608	1, 722, 500	2 65	4, 564, 625	2, 496, 700	4 40	10, 985, 480
Illinois	725, 100	30 03	21, 774, 753	1, 408, 200	2 53	3, 562, 746	3, 409, 700	5 21	17, 764, 537
Wisconsin	442, 700	26 28	11, 634, 156	1, 187, 600	2 64	3, 135, 264	618, 800	4 41	2, 728, 908
Minnesota	196, 900	26 27	5, 172, 563	157, 400	2 81	442, 294	201, 200	4 79	963, 748
Iowa	569, 500	26 50	15, 091, 750	1, 732, 600	2 38	4, 123, 588	3, 693, 700	4 82	17, 803, 634
Missouri	421, 400	22 45	9, 460, 430	1, 408, 500	1 90	2, 676, 150	2, 603, 300	3 30	8, 590, 890
Kansas	231, 100	25 30	5, 846, 830	141, 000	2 06	290, 460	484, 600	5 13	2, 485, 998
Nebraska	49, 900	29 50	1, 472, 050	39, 100	2 22	86, 802	128, 500	4 51	579, 535
California	310, 500	35 28	10, 954, 440	4, 683, 200	2 31	10, 818, 192	448, 600	6 16	2, 763, 376
Oregon	73, 500	24 42	1, 794, 870	561, 500	2 50	1, 403, 750	171, 200	2 35	402, 320
Nevada	9, 000	37 50	337, 500	18, 000	2 75	49, 500	4, 900	8 50	41, 650
The Territories	258, 700	32 48	8, 402, 576	2, 640, 000	2 54	6, 705, 600	102, 800	7 62	783, 336
Total	10, 705, 300	....	299, 609, 309	33, 938, 200	....	88, 690, 569	30, 860, 900	....	134, 565, 526
Grand average of prices	....	27 99	....	....	2 61	....	....	4 36	....

AVERAGE PRICE OF PRINCIPAL CROPS.

The returns of prices by our correspondents are reliable and the number of counties represented sufficient to admit of closely approximate averages for the several States. These prices are of course those of home markets, representing the money received by the farmers themselves. The following tables give the average of local prices in each State, on the 1st of December of the year named, except for some of the first years, when prices were returned on the 1st of January of the year following; but for the sake of uniformity these averages are placed under the designation of the year just closed. They are medium prices, generally higher than those of the harvest time and not so high as in the later months of winter.

Average price of corn per bushel on the 1st of December in the years designated.

STATES.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Maine	$1 35	$1 59	$1 38	$1 27	$1 14	$0 98	$0 94	$0 91
New Hampshire	1 37	1 56	1 43	1 30	1 09	95	95	92
Vermont	1 41	1 52	1 34	1 40	1 10	99	84	85
Massachusetts	1 34	1 53	1 32	1 32	98	98	90	84
Rhode Island	1 42	1 64	1 65	1 28	1 06	99	90	82
Connecticut	1 26	1 50	1 35	1 30	1 14	1 07	92	94
New York	1 16	1 32	1 12	1 03	87	82	70	70
New Jersey	1 03	1 23	99	95	81	75	62	62
Pennsylvania	91	1 17	1 00	92	75	77	60	60
Delaware	87	1 02	85	....	65	60	55	53
Maryland	93	1 09	87	73	71	64	57	68
Virginia	73	85	76	91	65	67	58	59
North Carolina	1 12	1 04	78	1 00	78	71	62	64
South Carolina	1 58	1 15	1 00	1 40	1 06	92	96	94
Georgia	1 52	96	91	1 21	90	93	86	82
Florida	1 50	1 38	1 41	1 45	1 35	1 09	1 20	1 11
Alabama	1 51	79	86	1 14	93	92	78	84
Mississippi	1 57	1 09	74	1 12	98	98	88	85
Louisiana	1 23	1 10	75	1 09	1 10	1 12	88	90
Texas	94	75	62	73	1 06	1 11	43	80
Arkansas	1 14	77	63	92	80	66	73	80
Tennessee	77	55	49	77	47	51	48	58
West Virginia	64	89	75	79	64	63	55	54
Kentucky	49	65	47	66	48	47	37	44
Ohio	54	82	60	72	48	45	34	42
Michigan	82	96	76	74	55	59	43	47
Indiana	44	65	52	70	38	37	29	40
Illinois	43	68	43	57	35	32	24	32
Wisconsin	82	86	58	65	52	43	40	44
Minnesota	1 11	1 07	64	63	51	44	36	41
Iowa	44	55	37	50	34	23	18	31
Missouri	58	66	57	60	44	31	32	38
Kansas	63	55	99	44	58	29	22	31
Nebraska	68	74	69	37	36	25	18	28
California	....	....	....	90	1 20	1 16	1 00	73
Oregon	....	....	....	....	1 00	1 00	93	60

The range in the prices of corn in the several States would appear incredible to the casual observer. There is sometimes a difference of nearly a dollar, oftentimes of half a dollar, in local prices of places five hundred miles apart. Oregon has none but home markets, and realizes for corn 60 cents to $1 per bushel. Iowa has a surplus to send beyond State lines, and got 55 cents in 1867 and 18 cents in 1872, a fall of 67 per cent., on account of growing a surplus that became a drug in the market, and not because of cost of transportation. These prices ruled highest in 1867. Since, the average price in home markets was highest (75.3 cents) in 1869, the census year, when the deficiency in the crop was about 200,000,000 bushels. For three years there was an annual decline, 54.9 cents, 48.2, and 39.8. The deficiency of 1873 carried the average to 48.5 cents.

Average price of wheat per bushel on the 1st of December in the years designated.

States.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Maine	$2 86	$2 79	$2 40	$1 83	$1 78	$1 80	$1 92	$1 90
New Hampshire	2 58	2 89	2 42	1 85	1 59	1 72	1 84	1 88
Vermont	2 67	2 70	2 26	1 57	1 63	1 62	1 74	1 67
Massachusetts	2 78	2 81	2 40	1 75	1 75	1 68	1 95	1 66
Rhode Island	2 80	....	....	....	....	....	....	....
Connecticut	2 83	2 63	2 00	1 40	1 52	1 55	1 65	1 65
New York	2 67	2 64	2 08	1 37	1 41	1 51	1 65	1 60
New Jersey	2 93	2 58	2 11	1 34	1 43	1 54	1 73	1 65
Pennsylvania	2 67	2 43	1 98	1 23	1 27	1 45	1 67	1 50
Delaware	3 00	2 38	1 90	....	1 25	1 52	1 60	1 68
Maryland	2 94	2 43	2 09	1 30	1 28	1 52	1 68	1 54
Virginia	2 85	2 12	1 90	1 21	1 24	1 39	1 56	1 45
North Carolina	2 72	2 11	2 00	1 53	1 21	1 42	1 53	1 55
South Carolina	3 19	2 38	2 25	2 09	1 89	2 03	1 88	2 25
Georgia	2 72	2 35	2 20	1 65	1 47	1 66	1 73	1 75
Florida	....	....	2 75	....	....	....	....	....
Alabama	2 34	2 05	1 98	1 62	1 28	1 56	1 48	1 70
Mississippi	2 53	2 40	2 19	1 75	1 52	1 59	1 57	1 75
Louisiana	2 50	2 50	....	1 25	....	....	....	....
Texas	1 45	1 89	2 25	1 70	1 73	1 97	1 65	1 40
Arkansas	2 06	2 01	2 00	1 51	1 30	1 55	1 52	1 50
Tennessee	2 21	2 11	1 88	1 15	97	1 28	1 40	1 33
West Virginia	2 67	2 39	1 88	1 26	1 22	1 31	1 43	1 43
Kentucky	2 30	2 17	1 86	1 10	1 00	1 29	1 29	1 21
Ohio	2 52	2 36	1 65	1 03	1 00	1 26	1 42	1 31
Michigan	2 55	2 34	1 64	97	1 08	1 32	1 40	1 35
Indiana	2 41	2 21	1 50	93	1 00	1 26	1 32	1 22
Illinois	1 93	1 97	1 20	76	94	1 18	1 23	1 10
Wisconsin	1 67	1 77	1 00	68	90	1 11	1 03	97
Minnesota	1 36	1 48	83	59	83	1 00	83	80
Iowa	1 42	1 43	95	52	78	96	85	79
Missouri	2 01	2 00	1 49	80	91	1 16	1 41	1 13
Kansas	1 91	1 84	1 35	79	86	1 13	1 42	1 00
Nebraska	1 23	1 32	96	51	64	90	78	75
California	....	....	....	93	1 10	1 41	1 11	1 32
Oregon	....	....	....	....	95	1 04	74	90

The national average of wheat in home markets was highest for a period of six years in 1868, being $1.42 per bushel. The very next year, 1869, the largest crop of the decade, brought 94 cents. Our estimate of 1870 was only 235,000,000 bushels, and the price went up to $1.04. Our estimate of 1871 was still less, 230,000,000, and there began to be a manifest scarcity, in sympathy with which the price advanced to $1.25. In 1872, with a moderate crop, estimated at 250,000,000, a good foreign demand, and an apprehension of scarcity not yet quieted, the price only receded to $1.24. With the large yield of 1873 the price could not have exceeded $1 but for the Russian failure, which pushed the average to $1.15.

Average price per bushel of rye on the 1st of December in the years designated.

States.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Maine	$1 39	$1 61	$1 61	$1 43	$1 38	$1 19	$1 09	$1 15
New Hampshire	1 39	1 62	1 58	1 38	1 24	1 13	1 04	1 10
Vermont	1 51	1 62	1 43	1 45	1 15	1 11	1 13	95
Massachusetts	1 38	1 58	1 66	1 30	1 10	1 12	1 03	1 04
Rhode Island	1 44	1 65	1 85	1 40	1 27	1 05	98	97
Connecticut	1 50	1 63	1 48	1 38	1 16	1 17	1 10	1 06
New York	1 21	1 50	1 37	1 03	97	88	89	86
New Jersey	1 26	1 63	1 50	1 12	97	94	88	85
Pennsylvania	1 17	1 41	1 32	99	89	86	86	81
Delaware	1 33	1 50	....	....	....	75	82	87
Maryland	1 16	1 45	1 35	97	78	85	79	80
Virginia	1 06	1 14	1 18	91	73	71	72	78
North Carolina	1 70	1 41	1 29	1 15	97	86	93	85
South Carolina	1 98	1 79	1 58	1 68	1 70	1 55	1 48	1 60
Georgia	1 34	1 77	1 70	1 51	1 40	1 56	1 56	1 64
Florida	....	....	1 75	....	....	1 50	....	....
Alabama	2 12	1 63	1 69	1 47	1 06	1 80	1 28	1 56
Mississippi	2 03	1 92	1 97	1 70	1 62	1 70	1 75	1 60
Louisiana	2 50	....	....	....	....	....	....	....
Texas	1 08	1 23	1 59	1 10	1 11	1 65	1 38	1 10
Arkansas	1 67	1 31	1 06	1 35	1 00	1 75	1 50	1 50
Tennessee	1 18	1 20	1 25	1 00	81	92	88	90
West Virginia	1 11	1 20	1 22	90	83	87	88	84
Kentucky	1 12	1 38	1 22	84	71	81	73	77
Ohio	1 09	1 26	1 14	82	76	77	73	75
Michigan	1 06	1 30	1 09	75	75	76	74	72
Indiana	1 03	1 18	1 06	76	70	72	65	71
Illinois	79	1 19	93	64	60	56	50	58
Wisconsin	88	1 14	90	62	62	60	57	62
Minnesota	97	1 11	68	56	56	63	49	51
Iowa	69	1 04	85	52	58	51	47	48
Missouri	97	1 15	96	69	68	59	71	64
Kansas	96	1 15	1 03	69	69	67	71	56
Nebraska	92	1 02	1 00	53	54	55	40	53
California	....	....	....	1 22	1 19	1 40	1 02	90
Oregon	....	....	....	....	87	95	73	82

The general average of home prices of rye has receded each year since 1868, when it stood very high, at $1.27, until it has fallen to 76 cents. It is a small crop, almost unknown in some places. The high figures noted in the South arise from the fact that the grain is rarely saved, and the little reported is used for seed, always bearing high prices, for sowing winter-pastures.

Average price of oats per bushel on the 1st of December in the years designated.

States.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Maine	$0 69	$0 80	$0 82	$0 68	$0 65	$0 66	$0 50	$0 58
New Hampshire	68	80	76	69	66	63	59	55
Vermont	63	77	75	67	59	53	48	49
Massachusetts	76	90	90	73	73	70	61	59
Rhode Island	73	84	77	71	61	60	50	61
Connecticut	71	85	82	73	69	65	61	60
New York	61	76	74	56	58	51	44	43
New Jersey	61	73	69	57	54	52	48	49
Pennsylvania	50	66	64	47	48	49	43	43
Delaware	55	73	60	....	50	41	42	46
Maryland	55	68	64	51	47	48	40	44
Virginia	45	48	54	48	42	49	46	44
North Carolina	71	64	65	65	57	63	80	56
South Carolina	1 11	75	85	95	84	87	80	85
Georgia	1 00	90	79	95	83	80	83	75
Florida	1 25	1 25	1 00	1 37	1 00	1 01	93	1 02
Alabama	1 05	87	88	91	79	87	82	78
Mississippi	1 09	1 07	1 01	98	90	96	1 06	86
Louisiana	....	1 62	....	1 15	75	1 12	1 32	84
Texas	86	79	90	70	1 00	1 04	81	82
Arkansas	94	83	80	75	62	73	64	70
Tennessee	51	62	63	60	46	46	42	41
West Virginia	45	51	51	46	40	44	38	38
Kentucky	48	57	48	48	40	41	49	36
Ohio	40	54	50	46	38	35	29	35
Michigan	47	68	50	49	39	41	32	34
Indiana	35	49	46	44	35	33	25	32
Illinois	33	49	39	37	32	28	19	28
Wisconsin	54	59	49	40	39	35	32	33
Minnesota	72	72	48	42	31	34	26	33
Iowa	39	42	35	35	30	21	16	27
Missouri	44	49	43	40	37	30	23	30
Kansas	47	49	57	37	40	30	22	23
Nebraska	46	59	54	34	30	25	16	26
California	....	....	....	62	59	70	74	84
Oregon	....	....	....	....	46	77	51	42

The average price of oats has declined yearly since 1868, when it was 55.8 cents, to 1872, when it was 33.6 cents. In 1873 it advanced to 37.5. In New England the decline has been less than in other sections. In the South prices are still high, as oats are always scarce and in demand, only acclimated kinds being safe from the destruction caused by rust. The great increase in the area of oats in Wisconsin and Ohio has caused a very marked reduction, though prices are better sustained there still than in other Western States.

Average price of barley per bushel on the 1st of December in the years designated.

States.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Maine	$1 02	$1 13	$1 26	$1 14	$0 99	$0 87	$0 83	$0 91
New Hampshire	1 19	1 24	1 47	1 05	1 07	98	92	1 00
Vermont	1 23	1 46	1 44	1 34	1 01	1 22	86	86
Massachusetts	1 27	1 54	1 56	1 56	1 08	1 07	76	1 03
Rhode Island	1 15	1 42	1 60	1 28	96	1 00	90	1 15
Connecticut	1 27	1 45	1 26	....	1 02	....	....	1 10
New York	1 06	1 47	1 78	99	85	78	81	1 10
New Jersey	1 00	1 27	....	....	....	....	....	1 10
Pennsylvania	1 09	1 37	1 64	1 02	91	90	88	1 05
Delaware	....	....	....	....	....	....	....	90
Maryland	1 00	1 27	1 22	....	....	....	....	85
Virginia	95	1 05	....	87	....	....	....	70
North Carolina	....	....	1 25	....	61	....	....	66
South Carolina	....	2 00	....	2 50	1 62	....	....	2 00
Georgia	1 84	2 03	2 15	1 83	1 64	1 77	....	1 20
Florida	....	....	....	....	....	....	....	....
Alabama	1 87	1 96	1 83	1 81	1 00	....	....	....
Mississippi	2 08	1 50	....	....	....	....	....	....
Louisiana	....	....	....	....	....	....	....	....
Texas	97	1 10	2 16	1 04	1 33	....	1 00	1 04
Arkansas	1 50	2 00	....	....	....	....	....	....
Tennessee	1 39	1 34	1 43	1 12	75	72	....	85
West Virginia	1 19	1 40	1 86	1 06	85	70	95	92
Kentucky	1 37	1 33	1 67	1 23	1 05	84	73	1 00
Ohio	1 14	1 29	1 47	1 02	86	74	71	98
Michigan	1 02	1 36	1 56	85	80	93	81	91
Indiana	1 07	1 22	1 57	1 03	83	72	69	1 06
Illinois	68	1 28	1 36	90	62	52	55	95
Wisconsin	90	1 35	1 35	80	67	56	57	1 08
Minnesota	83	1 07	1 14	64	54	46	42	77
Iowa	67	1 16	1 24	61	63	46	42	73
Missouri	1 03	1 46	1 74	1 12	84	62	73	86
Kansas	94	1 10	98	83	75	70	60	70
Nebraska	84	96	1 41	71	65	46	39	82
California	....	....	....	65	98	1 08	85	86
Oregon	....	....	....	....	68	84	60	52

Average price of potatoes per bushel on the 1st of December in the years designated.

States.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Maine	$0 51	$0 93	$0 78	$0 52	$0 66	$0 46	$0 68	$0 52
New Hampshire	49	81	71	45	79	49	87	48
Vermont	43	69	60	38	51	37	53	44
Massachusetts	69	1 11	93	68	96	68	88	70
Rhode Island	80	1 16	1 07	68	98	73	90	81
Connecticut	81	1 10	91	63	99	68	82	83
New York	69	90	76	51	65	48	63	54
New Jersey	86	1 41	97	62	94	66	87	67
Pennsylvania	76	1 04	93	60	78	55	63	65
Delaware	70	1 00	1 00	....	1 00	50	1 00	78
Maryland	80	1 10	93	64	90	71	88	70
Virginia	66	66	74	69	71	71	72	71
North Carolina	71	62	89	80	70	71	70	69
South Carolina	1 03	76	1 55	1 33	1 15	1 38	1 00	1 10
Georgia	77	62	1 48	1 40	1 34	1 42	1 27	1 15
Florida	85	1 10	1 70	....	....	1 93	1 87	....
Alabama	79	59	1 51	1 80	1 37	1 06	1 15	1 20
Mississippi	64	78	1 45	1 09	1 16	1 35	1 16	1 20
Louisiana	1 21	1 21	1 75	75	1 16	1 37	87	1 05
Texas	70	69	1 50	1 80	1 33	1 85	1 89	1 65
Arkansas	81	1 02	1 32	1 00	1 07	1 11	1 02	1 00
Tennessee	72	89	75	73	52	68	57	66
West Virginia	72	81	90	57	58	66	60	70
Kentucky	67	98	67	53	63	78	58	62
Ohio	77	1 00	84	42	81	63	63	88
Michigan	56	73	56	37	58	83	63	76
Indiana	57	97	75	44	83	82	54	85
Illinois	64	1 20	81	41	64	85	46	1 12
Wisconsin	64	69	72	52	74	55	44	80
Minnesota	72	92	61	72	95	39	26	63
Iowa	89	79	63	51	52	38	22	88
Missouri	79	97	90	47	56	64	50	87
Kansas	1 59	1 02	94	46	56	69	42	94
Nebraska	1 75	1 33	1 05	40	56	32	28	98
California	....	....	....	79	1 35	91	1 13	85
Oregon	....	....	....	....	77	1 03	55	56

Average price per ton of hay on the 1st of December in the years designated.

States.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Maine	$19 28	$14 62	$12 00	$15 25	$19 69	$26 00	$12 80	$12 20
New Hampshire	17 88	15 00	13 50	15 00	19 85	23 00	14 66	15 00
Vermont	15 61	15 36	14 50	13 00	14 50	17 50	13 00	13 38
Massachusetts	28 39	22 12	18 37	24 42	26 14	29 60	21 37	25 10
Rhode Island	31 66	26 62	20 00	21 75	24 00	33 33	32 50	27 50
Connecticut	25 60	21 60	17 25	18 00	25 60	31 20	26 05	25 00
New York	16 18	17 47	15 00	12 66	17 21	19 42	18 60	18 00
New Jersey	25 00	22 13	19 00	20 20	19 44	26 70	31 60	21 50
Pennsylvania	16 14	14 83	16 00	14 85	13 05	20 76	22 81	17 60
Delaware	17 50	17 66	20 00	....	20 00	17 50	30 00	26 00
Maryland	20 27	17 54	16 77	17 95	16 33	25 71	32 87	19 00
Virginia	14 28	19 48	13 00	15 41	14 72	17 82	21 25	17 20
North Carolina	13 00	12 06	15 00	12 11	11 47	12 30	11 15	13 00
South Carolina	23 00	19 50	17 00	23 33	21 66	21 60	36 00	27 00
Georgia	23 62	21 58	21 90	21 45	23 33	23 06	25 31	20 50
Florida	20 62	....	....	....	....	....	....	....
Alabama	18 63	20 00	19 28	26 25	20 00	19 50	13 33	18 50
Mississippi	27 50	16 43	17 00	19 33	21 25	21 66	24 14	20 25
Louisiana	30 00	19 75	10 00	....	28 50	25 00	23 33	17 50
Texas	13 60	16 60	10 00	14 18	15 36	24 33	13 52	12 75
Arkansas	26 43	20 75	16 00	12 60	15 00	20 87	20 00	16 00
Tennessee	18 63	18 95	15 50	20 34	16 64	16 58	15 16	15 50
West Virginia	12 22	11 44	15 00	11 17	10 00	14 58	16 57	14 00
Kentucky	12 80	14 80	13 25	14 66	13 25	14 27	13 09	13 00
Ohio	11 00	12 32	13 80	10 90	11 02	11 91	14 43	14 61
Michigan	13 75	16 14	15 00	12 80	11 17	17 33	12 26	11 00
Indiana	9 44	11 63	11 09	10 52	11 46	12 78	12 53	11 50
Illinois	9 27	9 73	10 00	9 87	10 74	10 05	9 47	8 75
Wisconsin	12 25	11 11	11 00	10 50	10 43	10 63	9 82	9 50
Minnesota	7 00	7 28	7 00	8 60	6 77	6 27	5 67	5 60
Iowa	6 20	5 77	6 50	7 70	7 70	6 09	6 07	6 25
Missouri	9 91	11 11	11 00	11 17	12 82	10 66	9 73	9 50
Kansas	7 18	5 08	8 16	5 55	7 18	4 91	3 80	3 90
Nebraska	6 43	5 54	5 40	5 03	5 60	4 76	3 81	4 50
California	....	....	....	12 70	16 70	21 85	15 60	16 50
Oregon	....	....	....	....	12 05	19 40	17 25	10 50

The general average for all the States in the years named is as follows:

Products.	1873.	1872.	1871.	1870.	1869.	1868.
Corn	$0 48.5+	$0 39.8+	$0 48.2+	$0 51.9+	$0 75.3+	$0 62.8
Wheat	1 15.1+	1 24.0+	1 25.8+	1 04.2+	94.1+	1 42.4
Rye	76	76.3+	79.0+	81.5+	97.1+	1 27.4
Oats	37	53.6+	40.1+	43.3+	47.6+	55.8
Barley	92	73.8+	80.6+	84.5+	81.6+	1 30.1
Potatoes	....	59.9+	53.6+	72 +	53.5+	79.3
Hay	13 66.6+	14 52.8+	15 81.5+	13 82 +	12 78 +	13 46

Product of wheat, in bushels, in the several States of the United States, as reported in the census, and since 1869, in the estimates of the statistical division of the Department of Agriculture.

States.	1859.	1869.	1870.	1871.	1872.	1873.
Alabama	1, 218, 444	1, 055, 068	1, 041, 000	832, 000	1, 106, 000	844, 000
Arkansas	957, 601	741, 736	1, 251, 000	688, 000	701, 000	785, 000
California	5, 925, 470	16, 676, 702	14, 175, 000	16, 757, 000	25, 600, 000	21, 504, 000
Connecticut	52, 401	38, 144	38, 000	38, 700	37, 100	39, 700
Delaware	912, 941	895, 477	626, 000	688, 000	550, 000	588, 000
Florida	2, 808	....	....	....	....	....
Georgia	2, 544, 913	2, 127, 017	2, 387, 000	1, 718, 000	3, 109, 000	2, 176, 000
Illinois	23, 837, 023	30, 128, 405	27, 115, 000	25, 216, 000	24, 711, 000	28, 417, 000
Indiana	16, 848, 267	27, 747, 222	20, 200, 000	19, 190, 000	19, 381, 000	20, 832, 000
Iowa	8, 449, 403	29, 435, 692	20, 445, 000	18, 400, 000	22, 080, 000	34, 600, 000
Kansas	194, 173	2, 391, 198	2, 343, 000	2, 694, 000	2, 155, 000	4, 330, 000
Kentucky	7, 394, 809	5, 728, 704	5, 010, 000	4, 488, 000	7, 854, 000	7, 225, 000
Louisiana	32, 208	9, 906	41, 000	....	....	....
Maine	233, 876	278, 793	264, 000	269, 000	293, 000	218, 000
Maryland	6, 103, 480	5, 774, 503	4, 792, 000	5, 654, 000	3, 957, 000	5, 262, 000
Massachusetts	119, 783	34, 648	35, 000	36, 000	32, 000	31, 000
Michigan	8, 336, 368	16, 265, 773	15, 288, 000	16, 205, 000	13, 936, 000	14, 214, 000
Minnesota	2, 186, 993	18, 866, 073	16, 022, 000	12, 016, 000	23, 200, 000	28, 056, 000
Mississippi	587, 925	274, 479	221, 000	198, 000	199, 000	189, 000
Missouri	4, 227, 586	14, 315, 926	6, 750, 000	12, 825, 000	7, 695, 000	11, 927, 000
Nebraska	....	2, 125, 086	1, 848, 000	1, 829, 000	2, 560, 000	3, 584, 000
Nevada	....	228, 866	251, 000	281, 000	314, 000	345, 000
New Hampshire	238, 965	193, 621	174, 000	186, 000	182, 000	169, 000
New Jersey	1, 763, 218	2, 301, 433	1, 680, 000	2, 100, 000	1, 680, 000	1, 948, 000
New York	8, 681, 105	12, 178, 462	9, 133, 000	9, 589, 000	6, 712, 000	7, 047, 000
North Carolina	4, 743, 706	2, 859, 879	4, 218, 000	2, 530, 000	3, 289, 000	2, 795, 000
Ohio	15, 119, 047	27, 882, 159	19, 150, 000	18, 575, 000	18, 203, 000	18, 567, 000
Oregon	826, 776	2, 340, 746	2, 270, 000	2, 292, 000	2, 406, 000	3, 127, 000
Pennsylvania	13, 042, 165	19, 672, 967	17, 115, 000	19, 339, 000	11, 603, 000	15, 548, 000
Rhode Island	1, 131	784	700	700	....	....
South Carolina	1, 285, 631	783, 610	1, 012, 000	586, 000	662, 000	522, 000
Tennessee	5, 459, 268	6, 188, 916	7, 357, 000	5, 149, 000	10, 298, 000	7, 414, 000
Texas	1, 478, 345	415, 112	1, 225, 000	551, 000	1, 377, 000	1, 404, 000
Vermont	437, 037	454, 703	409, 000	413, 000	392, 000	399, 000
Virginia	13, 130, 977	7, 398, 787	6, 705, 000	6, 360, 000	9, 432, 000	5, 788, 000
West Virginia	....	2, 483, 543	2, 533, 000	2, 608, 000	2, 712, 000	2, 657, 000
Wisconsin	15, 657, 458	25, 606, 344	20, 485, 000	18, 436, 000	22, 307, 000	26, 322, 000
The Territories	1, 070, 623	1, 844, 152	1, 675, 000	1, 976, 000	2, 272, 000	2, 340, 000
Total	173, 104, 924	287, 745, 626	235, 884, 700	230, 722, 400	249, 997, 100	280, 372, 700

Statement showing the quantity of wheat and flour exported during each fiscal year from 1856 to 1873 inclusive.

Years.	Wheat, (bushels.)	Flour, (barrels.)	Total wheat and flour, (bushels.)
1856	8, 154, 877	3, 510, 626	25, 708, 007
1857	14, 570, 331	3, 712, 053	33, 130, 596
1858	8, 926, 196	3, 512, 169	26, 487, 041
1859	3, 002, 016	2, 431, 824	15, 161, 136
1860	4, 155, 153	2, 611, 596	17, 213, 133
1861	31, 238, 057	4, 323, 756	52, 856, 837
1862	37, 289, 572	4, 882, 033	61, 699, 737
1863	36, 160, 414	4, 390, 055	58, 110, 689
1864	23, 681, 712	3, 557, 347	41, 468, 447
1865	9, 937, 152	2, 604, 542	22, 959, 862
1866	5, 579, 103	2, 183, 050	16, 494, 353
1867	6, 146, 411	1, 300, 106	12, 646, 941
1868	15, 940, 899	2, 076, 423	26, 323, 014
1869	17, 557, 836	2, 431, 873	29, 717, 201
1870	36, 584, 115	3, 463, 333	53, 900, 780
1871	34, 304, 906	3, 653, 841	52, 574, 111
1872	26, 423, 080	2, 514, 535	38, 995, 755
1873	39, 204, 285	2, 562, 086	52, 014, 715
Total	358, 856, 115	55, 721, 248	637, 462, 355
Total for forty-eight years ending with 1873	391, 017, 109	101, 417, 127	898, 102, 764

Estimated product, export, and home consumption of wheat during seven years ending with 1873.

Years.	Production, (bushels.)	Export, (bushels.)	Consumption, (bushels.)	Seed, (bushels.)
1867	212, 441, 400	36, 323, 014	148, 636, 045	27, 482, 341
1868	224, 036, 600	29, 717, 201	166, 629, 201	27, 690, 198
1869	260, 146, 900	53, 900, 780	177, 474, 614	28, 771, 506
1870	235, 884.700	52, 574, 111	154, 821, 703	28, 488, 886
1871	230, 722, 400	38, 995, 755	161, 810, 806	29, 915, 839
1872	249, 997, 100	52, 014, 715	166, 694, 847	31, 287, 538
1873	280, 372, 700	72, 297, 355	174, 948, 084	33, 127, 261
Total	1, 691, 602, 700	335, 822, 931	1, 151, 015, 300	206, 763, 569
Average	241, 757, 528	47, 974, 704	164, 430, 757	29, 523, 367

FOREIGN DEMAND FOR WHEAT.

We have repeatedly shown it to be the policy of nations to supply their own people with wheat and other bread equivalents, and that few fail to do so, and fewer still undertake as a permanent policy the production of cereals for exportation. Among the latter Russia and the United States are the most prominent; France and Germany always export something, but often partially balance exports by subsequent imports. Great Britain is the only regular and extensive purchaser. That the reader may study the wants of Great Britain, and means of supply, the following table is given, compiled from the official records of British imports:

Statement showing the sources of supply of wheat to Great Britain, as presented in official tables of imports, being the total imports of wheat and flour (in equivalent weight of grain) in fifteen years.

Year.	United States.	Russia.	Germany.	France.	British America.	Other countries.	Total.
	Cwt.	*Cwt.*	*Cwt.*	*Cwt.*	*Cwt.*	*Cwt.*	*Cwt.*
1858	4, 782, 785	2, 653, 883	4, 210, 117	5, 581, 064	702, 838	5, 270, 254	23, 201, 941
1859	430, 504	3, 837, 454	4, 561, 521	8, 124, 978	170, 821	4, 372, 456	21, 497, 734
1860	9, 315, 125	5, 659, 071	6, 904, 819	4, 583, 412	1, 310, 652	4, 067, 947	31, 841, 926
1861	15, 610, 472	4, 540, 483	6, 658, 462	1, 359, 882	3, 387, 949	6, 089, 457	37, 646, 705
1862	21, 765, 087	5, 755, 785	7, 930, 849	1, 061, 835	5, 118, 698	7, 510, 140	50, 042, 394
1863	11, 869, 179	4, 538, 934	5, 728, 626	1, 857, 403	3, 198, 187	3, 695, 563	30, 887, 802
1864	10, 077, 431	5, 129, 410	6, 642, 721	2, 854, 421	1, 831, 897	2, 101, 320	28, 837, 203
1865	1, 498, 579	8, 093, 989	7, 224, 371	6, 058, 902	528, 456	2, 439, 255	25, 843, 552
1866	986, 229	9, 181, 432	6, 801, 657	8, 023, 530	59, 601	4, 319, 230	29, 371, 679
1867	5, 091, 733	14, 160, 794	7, 873, 210	2, 140, 832	835, 006	9, 029, 199	39, 136, 780
1868	6, 753, 389	10, 055, 338	7, 224, 597	846, 863	798, 505	10, 827, 353	36, 506, 045
1869	15, 320, 257	9, 187, 236	7, 546, 688	2, 153, 350	3, 396, 511	6, 843, 730	44, 447, 772
1870	15, 057, 236	10, 326, 844	4, 487, 773	1, 060, 120	3, 402, 690	2, 571, 452	36, 906, 115
1871	15, 625, 331	15, 689, 943	4, 258, 823	182, 262	3, 782, 776	4, 823, 092	44, 362, 227
1872	9, 634, 349	17, 938, 977	5, 183, 601	4, 553, 781	2, 157, 170	8, 145, 018	47, 612, 896

This makes a total of 528,141,861 cwt. of wheat (or its equivalent in flour,) imported into Great Britain in the past fifteen years. This is a yearly average of 35,209,487 cwt., or 65,724,319 bushels of sixty pounds each. The requirements of the past five years have exceeded this average, though in 1870 by a small excess. The amount for 1872 is about eighty-eight million bushels. Many have supposed that Russia is the heaviest contributor to these supplies, but these official figures show, when subjected to analysis, that the United States furnishes the largest proportion, the total for fifteen years being 143,817,686 cwt., or 27 per cent. of all, while the proportion for Russia is 24 per cent., or 126,756,477

cwt. Germany (exclusive of the duchies up to 1860,) contributes 17 per cent., (93,437,841 cwt.,) and France 9 per cent., (51,342,638 cwt.) British America has sent 5 per cent. These prominent contributions (with fractions of percentage omitted,) make 84 per cent., leaving but 16 per cent. to all other sources of supply.

The absurdity of the theory that there is a surplus of wheat produced is strongly shown in the fact that only the United States and Russia are reliable in a series of years for any surplus whatever, that their excess is nearly all required to make up the deficiency of a single country, and that there never is any other outlet for such excess. Estimates have been rife, in commercial quarters, of a requirement of two hundred million bushels by nations having deficient wheat-crops in 1873. It is utterly impossible to find such a surplus, if necessary, or indeed much more than half of it.

The following table gives the British official figures for 1872 and 1873, with the cost in pounds sterling and dollars, and the cost per cwt.

Quantities and declared values of wheat, wheat-flour, and wheat-meal imported into the United Kingdom during 1872 and 1873.

	Quantities.		Declared values.		United States gold values, rating the pound sterling at $5.		Values per cwt.	
	1872.	1873.	1872.	1873.	1872.	1873.	1872.	1873.
Wheat from—	*Cwt.*	*Cwt.*						
Russia	17, 840, 640	9, 598, 096	£10,591,335	£6,072, 723	$52, 956, 675	$30, 363, 615	$2 96	$3 16
Denmark	431, 176	301, 758	290, 812	205, 450	1, 454, 060	1, 027, 250	3 37	3 40
Germany	3, 887, 740	2, 153, 857	2, 646, 469	1, 544, 850	13, 232, 345	7, 724, 250	3 40	3 58
France	2, 843, 016	1, 170, 522	1, 840, 271	747, 737	9, 201, 355	3, 738, 685	3 23	3 19
Austrian territories	54, 732	29, 730	33, 979	18, 616	169, 895	93, 080	3 10	3 13
Turkey, Moldavia, and Wallachia	838, 073	367, 487	454, 269	218, 565	2, 271, 345	1, 092, 825	2 71	2 98
Egypt	2, 337, 208	1, 260, 401	1, 178, 675	697, 194	5, 893, 375	3, 485, 970	2 52	2 76
United States	8, 606, 403	19, 742, 726	5, 593, 501	12, 895, 779	27, 967, 505	64, 478, 895	3 25	3 31
Chili	1, 434, 125	1, 557, 128	947, 538	980, 702	4, 737, 690	4, 903, 510	3 30	3 15
British North America	1, 719, 378	3, 767, 330	1, 138, 437	2, 486, 584	5, 692, 185	12, 432, 920	3 31	3 30
Other countries	1, 997, 731	3, 802, 595	1, 331, 590	2, 578, 489	6, 657, 950	12, 892, 445	3 33	3 39
Total	41, 990, 228	43, 751, 630	26, 046, 876	28, 446, 689	130, 234, 380	142, 233, 445	3 10	3 25
Wheat meal and flour from—								
Germany	1, 054, 574	687, 243	990, 558	679, 885	4, 952, 790	3, 399, 425	4 69	4 94
France	1, 341, 465	1, 669, 356	1, 229, 376	1, 598, 878	6, 146, 880	7, 994, 390	4 58	4 79
United States	743, 412	1, 580, 697	627, 823	1, 380, 792	3, 139, 115	6, 903, 960	4 22	4 37
British North America	339, 300	444, 729	298, 257	399, 130	1, 491, 285	1, 995, 650	4 39	4 48
Other countries	917, 308	1, 822, 235	946, 175	1, 780, 512	4, 730, 875	8, 902, 560	5 15	4 88
Total meal and flour	4, 396, 059	6, 204, 260	4, 092, 189	5, 839, 197	20, 460, 945	29, 195, 985	4 65	4 70

The short crop in Russia in 1873 reduced the exportation to Great Britain from 17,840,640 cwt. to 9,598,096 cwt. Here was a deficiency of 8,242,544 cwt. which the United States more than made good, in an increase of exports from 8,606,403 cwt. to 19,742,726, or 2,893,777 cwt. more than the Russian decline, and swelling the total receipts of Great Britain for the year 1873 by the sum of 1,761,402 cwt. over the previous importation. The principal receipts classed under "other countries" come from British America.

PRODUCT AND EXPORT-PRICES OF CORN IN THE UNITED STATES.

Product of corn, in bushels, in the several States of the United States, as reported in the census, and since 1869, in the estimates of the statistical division of the Department of Agriculture.

States.	1859.	1869.	1870.	1871.	1872.	1873.
Alabama	33, 226, 282	16, 977, 948	35, 334, 000	19, 080, 000	22, 896, 000	21, 751, 000
Arkansas	17, 823, 588	13, 382, 145	25, 000, 000	16, 250, 000	17, 062, 000	16, 208, 000
California	510, 708	1, 221, 222	1, 009, 000	934, 000	1, 400, 000	1, 540, 000
Connecticut	2, 059, 835	1, 570, 364	1, 413, 000	1, 624, 000	1, 705, 000	1, 534, 000
Delaware	3, 892, 337	3, 010, 390	3, 311, 000	3, 575, 000	3, 289, 000	2, 960, 000
Florida	2, 834, 391	2, 225, 056	2, 247, 000	2, 022, 000	1, 920, 000	2, 112, 000
Georgia	30, 776, 293	17, 646, 459	31, 000, 000	20, 150, 000	23, 777, 000	21, 014, 000
Illinois	115, 174, 777	129, 921, 395	201, 378, 000	203, 391, 000	217, 628, 000	143, 634, 000
Indiana	71, 588, 919	51, 094, 538	113, 150, 000	79, 205, 000	85, 541, 000	67, 840, 000
Iowa	42, 410, 686	68, 935, 065	93, 415, 000	99, 019, 000	101, 989, 000	105, 200, 000
Kansas	6, 150, 727	17, 025, 525	16, 685, 000	24, 693, 000	29, 631, 000	47, 000, 000
Kentucky	64, 043, 633	50, 091, 006	63, 345, 000	58, 843, 000	63, 534, 000	58, 451, 000
Louisiana	16, 853, 745	7, 596, 628	18, 000, 000	8, 100, 000	10, 125, 000	9, 112, 000
Maine	1, 546, 071	1, 089, 888	1, 198, 000	1, 078, 000	1, 218, 000	852, 000
Maryland	13, 444, 922	11, 701, 817	11, 818, 000	11, 227, 000	11, 002, 000	10, 451, 000
Massachusetts	2, 157, 063	1, 397, 807	1, 327, 000	1, 419, 000	1, 461, 000	1, 446, 000
Michigan	12, 444, 676	14, 086, 238	19, 035, 000	16, 179, 000	16, 987, 000	14, 099, 000
Minnesota	2, 941, 952	4, 743, 117	5, 823, 000	8, 152, 000	7, 988, 000	7, 189, 000
Mississippi	29, 057, 682	15, 637, 316	30, 300, 000	18, 180, 000	21, 816, 000	18, 543, 000
Missouri	72, 892, 157	66, 034, 075	94, 990, 000	87, 390, 000	105, 741, 000	70, 846, 000
Nebraska	....	4, 736, 710	5, 163, 000	7, 228, 000	7, 589, 000	4, 533, 000
Nevada	....	9, 660	11, 000	12, 000	13, 000	12, 000
New Hampshire	1, 414, 628	1, 277, 768	1, 213, 000	1, 273, 000	1, 374, 000	1, 305, 000
New Jersey	9, 723, 336	8, 745, 384	10, 057, 000	10, 559, 000	12, 142, 000	10, 442, 000
New York	20, 061, 049	16, 462, 825	19, 426, 000	17, 483, 000	19, 231, 000	17, 692, 000
North Carolina	30, 078, 564	18, 454, 215	22, 500, 000	20, 700, 000	24, 012, 000	21, 130, 000
Ohio	73, 543, 190	67, 501, 144	87, 751, 000	89, 506, 000	99, 351, 000	88, 422, 000
Oregon	76, 122	72, 138	88, 000	85, 000	89, 000	94, 000
Pennsylvania	28, 196, 821	34, 702, 006	38, 866, 000	39, 254, 000	43, 964, 000	36, 929, 000
Rhode Island	461, 497	311, 957	280, 000	308, 000	295, 000	297, 000
South Carolina	15, 065, 606	7, 614, 207	12, 000, 000	9, 840, 000	10, 627, 000	9, 245, 000
Tennessee	52, 089, 926	41, 343, 614	51, 000, 000	45, 900, 000	46, 818, 000	42, 604, 000
Texas	16, 500, 702	20, 554, 538	23, 690, 000	20, 847, 000	27, 934, 000	23, 743, 000
Vermont	1, 525, 411	1, 699, 882	1, 920, 000	1, 747, 000	1, 921, 000	1, 748, 000
Virginia	38, 319, 999	17, 649, 304	19, 360, 000	19, 553, 000	18, 184, 000	19, 275, 000
West Virginia	....	8, 197, 865	9, 837, 000	9, 345, 000	9, 905, 000	10, 004, 000
Wisconsin	7, 517, 300	15, 033, 998	19, 995, 000	21, 391, 000	21, 180, 000	16, 308, 000
The Territories	2, 368, 117	1, 289, 335	1, 230, 000	1, 353, 000	1, 380, 000	1, 242, 000
Total	838, 792, 742	760, 944, 549	1, 094, 255, 000	991, 898, 000	1, 092, 719, 000	929, 827, 000

Average export prices of corn and corn-meal for periods of ten years.

Periods.	Corn, per bushel.	Corn-meal, per barrel.
Period ending 1840	$0 71¼	$3 73
Period ending 1850	69¾	3 31
Period ending 1860	72¾	3 76
Period ending 1870	81¼	5 00

The prices since 1860 have been as follows:

Years.	Corn, per bushel.	Corn-meal, per barrel.	Years.	Corn, per bushel.	Corn-meal, per barrel.
1861	$0 64½	$3 40	1868	$1 17½	$6 15
1862	55	3 07	1869	97. 8	5 35
1863	65¼	3 93	1870	92. 5	5 00
1864	81¼	5 14	1871	75. 9	4 48
1865	1 30	7 47	1872	69. 5	3 93
1866	82	4 76	1873	61. 8	3 65
1867	99¾	5 47			

RELATIVE PROFIT OF CORN AND WHEAT.

The great crop of the United States is maize. The favorite bread-food of civilized man is wheat, yet corn in this country occupies the next place as a bread-yielder, not so much a substitute as an adjunct, and available in a greater variety of acceptable forms than wheat itself. But the American does not live by bread alone, deeming himself a starveling without meat twice a day, if he lives in the East, and three times daily if he resides in the South or West. All of this supply of meat, in its early stages of production, coming either from green or cured grasses, is perfected by the almost exclusive use of maize, which is also a grass, rendering literal in a peculiar sense the saying that "all flesh is grass." Animal production might naturally be considered, in this country, the most important branch of husbandry: it is not only comparatively important, but it is pre-eminently profitable. This might be shown in many ways. A few statistical generalizations will furnish convincing proof.

First, the magnitude of this interest is a marvel. The supplies for man and beast are principally found in corn, hay, wheat, oats, potatoes, barley, rye, and buckwheat, named in the order of their aggregate money value. Should grass be included with hay, it would of course occupy the first place. Of these, corn, hay and oats are mainly used in feeding domestic animals; wheat, potatoes, rye, barley, and buckwheat are mainly consumed by man. Yet, taking only corn and hay, without a mention of corn-fodder or grass, in comparison with these six other food-products, the values for the past five years may be thus expressed, in the original estimates of value made annually by this Department:

	Corn.	Hay.	Six food-products.
1869	$658, 532, 700	$337, 662, 600	$515, 003, 218
1870	601, 839, 030	338, 969, 680	478, 252, 578
1871	478, 275, 900	351, 717, 035	505, 406, 212
1872	435, 149, 290	345, 969, 079	507, 536, 289
1873	447, 183, 020	339, 895, 486	546, 809, 143
Total	2, 620, 979, 940	1, 714, 213, 880	2, 553, 007, 440

The value of corn has therefore been $13,594,500 per annum more than the combined values of the six other crops named; and that of the cured grasses over two-thirds as much as the aggregate of the six crops. Could the value of the corn-fodder on one hand, and of the pasturage on the other, be added, the value of feeding supplies for domestic animals would be seen to be enormous. Nor can it be otherwise, in view of the variety of animal products required to sustain life and meet the demands of civilization—such as beef and pork in various forms, butter, cheese, milk, wool, leather, lard, tallow, stearine, soap, and a multitude of minor manufactures from animal substances, including valuable fertilizers contributed during the life and after the death of the animal for the perpetual maintenance of the producing capacity of the soil.

In response to the inquiry as to the comparative value per acre, it is easy to show the superiority of corn, notwithstanding the obvious reduction in price, by the immense quantity produced. The reported average of corn per acre may be a few cents lower, but the added value of the fodder will make it predominant, even after an allowance for a

possibly greater cost of production. The straw of the cereals should be of some value, but with few exceptions it is burned, and its fertilizing value dissipated, except a minute proportion of ash. The assumed aggregate of the corn acreage of five years is 184,565,343 acres, yielding in corn alone $14.21 per acre; the aggregate for the six crops, 345,166,063 acres, yielding $13.99 per acre. That overproduction reduces the value of the corn-crop is evident from a mere glance at the figures. In 1869, when the crop estimate was reduced to 874,000,000, the aggregate value was $658,000,000, and the value per acre $17.74, against $12.76 for wheat when that crop was the largest ever known; in 1870, with a corn-crop estimated at 1,094,000,000 bushels, the product was $601,000,000, or $57,000,000 less for a crop larger by 220,000,000 bushels. A result similar in kind, though far less marked in degree, is obtained by comparison of the crops of 1871 and 1872, the former being medium only, the latter large. In 1871 a crop of 991,000,000 bushels produced $478,000,000, or $14.02 per acre, while that of 1872, estimated at 1,092,000,000 bushels, was worth $435,000,000, or $12.24 per acre. This shows an increase of $38,000,000 from a decrease of 101,000,000 bushels.

This makes a favorable showing for corn; but the strongest point in its favor has not been touched. Being largely fed on the farm, it is in a measure restorative, while wheat, carried away from the farm without any return worth considering, is an exhaustive crop. These two diametrically opposite practices must produce opposite results upon soils, one making the rich richer, the other rendering the poor poorer. As might be expected, the complaint is constant that the wheat average grows less and less; and the fact is that it is only kept from heavy depreciation by a gradual removal of wheat-culture westward and freshlandward, as the wheat-farmers fold their tents, after the manner of the Arab, and as "silently steal away" to green prairies undisturbed by the plow.

Thus wheat-growing becomes nomadic, while cattle-feeding is stationary. It might naturally be expected that sections in which corn-growing has long been the ruling rural industry would exhibit more valuable improvements and higher average values of farm-lands. This theory is fully verified by an examination of the assessed valuations of agricultural sections in which the exhaustive and restorative systems of culture, as illustrated in the practice of corn and wheat farmers, are respectively predominant in a positive degree. While the planting of both these crops is practiced by almost all farmers in our cereal belt, there are sections in which one or the other greatly predominates; and there is no one of these States in which examples of such predominance are so marked as in Illinois. To make a fair test, let us take the counties yielding the heaviest product of corn, and as many making the largest quantities of wheat. Erasing from the record of wheat counties Madison and Saint Clair, whose valuations are manifestly increased by proximity to Saint Louis, but leaving Jersey, which remains the highest on the list, also quite near Saint Louis, and on the other hand, blotting Sangamon from the corn-list because much of its valuation arises from the fact of its being the capital of the State, there remains an area as purely agricultural as can be selected for such a test. There are eleven counties in each list, none of the corn counties producing in 1869 less than 2,500,000 bushels, or in an average year much less than 3,500,000 bushels; and none of the wheat counties yielding less than 500,000 bushels. The counties are as follows, with their respective yields of corn and wheat in 1869:

Corn counties.	Corn.	Wheat.	Wheat counties.	Wheat.	Corn.
Bureau	3, 030, 404	465, 960	Adams	963, 807	1, 452, 905
Champaign	3, 924, 720	222, 668	Clinton	611, 388	813, 257
Henry	2, 541, 683	462, 824	Greene	577, 400	1, 051, 313
Knox	2, 708, 319	275, 418	Jersey	558, 367	519, 120
La Salle	3, 077, 028	273, 374	Macoupin	861, 558	1, 051, 544
Logan	4, 221, 640	239, 019	Monroe	651, 767	543, 718
McLean	3, 723, 379	222, 756	Montgomery	744, 950	1, 527, 898
Morgan	3, 198, 835	375, 719	Pike	1, 057, 627	1, 399, 188
Mason	2, 648, 726	198, 889	Randolph	1, 031, 472	510, 080
Vermillion	2, 818, 027	294, 364	Stephenson	529, 512	1, 615, 679
Warren	2, 982, 853	192, 009	Washington	672, 486	836, 115
Total	34, 875, 614	3, 223, 100	Total	8, 260, 334	11, 320, 817

Nearly three times as much wheat is grown in the eleven wheat counties as in those of the other list; and the corn counties produce of maize a little more than three times the amount of corn placed to the credit of the wheat counties. The respective prominence of these industries in the two lists is sufficiently marked, the production of no county in the one entitling it to appear in the other.

The assessed valuations of farm-lands, including all improvements, should be considered in some sense indicative of the comparative profit of the industries which make these values. In the expectation of finding higher values in corn than in wheat counties the following tables were made from the State returns of 1871:

Corn counties.	Acres.	Value.	Value per acre.
Bureau	530, 530	$4, 206, 181	$7 93
Champaign	555, 707	4, 215, 595	7 59
Henry	512, 766	4, 980, 081	9 71
Knox	449, 255	3, 721, 268	8 28
La Salle	713, 390	3, 766, 992	5 28
Logan	389, 022	3, 676, 090	9 45
McLean	740, 728	5, 780, 483	7 78
Morgan	358, 035	4, 046, 086	11 30
Mason	358, 100	2, 148, 158	6 00
Vermillion	564, 047	4, 504, 379	7 99
Warren	341, 666	2, 503, 668	7 33
Total	5, 513, 246	43, 548, 981	7 89

Wheat counties.	Acres.	Value.	Value per acre.
Adams	525, 658	$4, 214, 303	$8 02
Clinton	302, 977	1, 734, 110	5 72
Greene	342, 347	2, 153, 425	6 29
Jersey	254, 254	2, 101, 759	8 26
Macoupin	546, 671	4, 089, 505	7 48
Monroe	237, 026	1, 252, 980	5 29
Montgomery	429, 216	2, 387, 486	5 56
Pike	511, 324	2, 891, 545	5 66
Randolph	360, 038	1, 901, 726	5 28
Stephenson	351, 870	2, 292, 249	6 52
Washington	326, 331	1, 941, 622	5 95
	4, 187, 712	$26, 960, 710	6 43

It is not unexpected that the average valuation per acre in the one case is $6.43, in the other $7.89, or 22 per cent. greater. It is true that

these values are not the cash values, the assessments being lower for purposes of taxation; yet the true proportion between the two alone is not necessarily affected by this fact. Yet to silence cavil, as well as to accumulate evidence, the census returns of farm-lands and their valuation are appealed to, with the following result:

Corn counties.	Acres.	Value.	Wheat counties.	Acres.	Value.
Bureau	456, 220	$18, 286, 039	Adams	419, 872	$21, 202, 263
Champaign	494, 650	16, 634, 591	Clinton	207, 767	5, 976, 205
Henry	309, 983	12, 152, 900	Greene	298, 303	11, 007, 844
Knox	397, 550	18, 806, 071	Jersey	146, 937	6, 065, 415
La Salle	584, 197	25, 274, 479	Macoupin	379, 626	13, 128, 576
Logan	339, 511	16, 168, 686	Monroe	176, 845	5, 355, 430
McLean	584, 431	24, 863, 681	Montgomery	332, 981	7, 961, 130
Morgan	355, 043	18, 818, 839	Pike	372, 130	14, 508, 922
Mason	272, 205	10, 100, 200	Randolph	304, 208	8, 127, 306
Vermillion	444, 451	14, 080, 111	Stephenson	311, 725	14, 678, 439
Warren	308, 064	15, 430, 489	Washington	235, 375	5, 518, 910
Total	4, 546, 365	189, 626, 686	Total	3, 185, 769	113, 530, 440

The State exhibit included all taxable lands, whether in farms or not and makes a total of 5,513,246 acres in corn counties, and 4,187,712 in wheat counties. The census statement includes only farms, the respective aggregates being 4,546,365 and 3,185,769 acres. The average value per acre is in one case $41.70, and in the other $35.63, a difference of 17 per cent. in favor of the corn district. This result is an additional confirmation of the theory of the superior profit in feeding corn over the transportation of wheat.

An objection may be urged that the corn counties have a better soil. There appears to be little ground for such objection in this case. Among the wheat counties, Adams, Pike, Jersey, Monroe, and Randolph lie on the Mississippi, and have a rich soil, much of it well adapted to large yields of corn; Greene borders on the Illinois; Macoupin and Montgomery adjoin the fertile corn-producing Sangamon; Clinton and Washington are three-fourths fertile prairie; and Stephenson, on the northern border, is the finest portion of the Rock River Valley. The corn counties are still more scattered, Champaign and Vermillion being in the eastern central part of the State. McLean, Logan, Morgan, and Mason occupy central positions; the others are north and west of the Illinois River, only two of which border upon it. Thus there is little difference in natural advantages. Were such differences apparent it would matter little in view of the fact that wealth derived from the soil depends far more upon its culture and treatment than upon its original stores of fertility. It is a notable fact that the largest crops and densest populations of Europe are found upon the less fertile districts; the richest soils are in the least populous districts, and are also less productive under present treatment.

An Illinoisan, whose views are entitled to respect, suggests that if the corn area has the larger proportion of timber this circumstance would render the valuation higher. The eleven counties have only 391,037 acres in woodland of the 4,546,365 acres in farms, or 8.6 per cent.; while the woodland of the wheat counties amounts to 908,756 acres in a total of 3,185,769, or 28.8 per cent. So this advantage inures to the benefit of wheat, and requires additional profits of corn-growing to offset it in the valuation tables.

Illinois undoubtedly furnishes the best test of this question, as the two industries are comparatively less separate elsewhere; but there is

a growing preponderance of one or the other in parts of Iowa. The following lists include respectively all counties producing in 1869 over 1,500,000 bushels of corn each, and those growing over 690,000 bushels of wheat each, the area and valuation being the official assessment for taxation in that year:

Corn counties.	Acres.	Value.	Value per acre.
Benton	450,321	$2,927,086	$6 50
Cedar	325,990	3,918,399	12 02
Clinton	438,940	4,297,222	9 79
Fremont	320,674	2,036,279	6 35
Jasper	451,490	3,300,391	7 31
Johnson	371,090	3,629,260	9 78
Linn	452,231	4,929,317	10 90
Mahaska	358,225	3,317,163	9 26
Marion	358,890	2,828,053	7 88
Polk	358,575	3,506,863	9 78
Scott	283,944	3,759,418	13 24
Warren	360,642	2,859,891	7 93
	4,531,012	41,309,342	9 11

Wheat counties.	Acres.	Value.	Value per acre.
Benton	450,321	$2,927,086	$6 50
Black Hawk	357,397	2,616,146	7 32
Buchanan	358,125	2,517,618	7 03
Clayton	483,502	3,403,854	7 04
Clinton	438,940	4,297,222	9 79
Delaware	361,649	2,632,804	7 28
Jasper	451,490	3,300,391	7 31
Linn	452,231	4,929,317	10 90
Marshall	366,032	2,602,487	7 11
Poweshiek	356,256	2,600,668	7 30
Tama	457,756	2,934,215	6 41
Winneshiek	435,781	1,895,647	4 35
	4,969,480	36,657,455	7 37

In these lists there are no very large towns, and some of the larger are found represented in each. Of the twelve, one-third are both corn and wheat counties, Benton, Clinton, Jasper, and Linn having more than the minimum limit of production of each crop. This fact must tend to equalize the average, though the profits of corn-culture should be equally marked here as in Illinois. The average per acre in the corn-list is seen to be $9.11, and that in the wheat counties $7.37, the percentage being 23 greater in the corn average. The census returns a much smaller area, not including taxable lands not in farms, with an average valuation of $9.11 for the corn counties, and $7.37 for the other list, or about 13 per cent. higher value for the corn-producing section.

Corn counties.	Acres in farms.	Value.	Wheat counties.	Acres in farms.	Value.
Benton	325,704	$8,716,034	Benton	325,704	$8,716,034
Cedar	290,810	10,473,122	Black Hawk	272,459	8,100,998
Clinton	396,406	12,964,845	Buchanan	244,622	6,021,232
Fremont	164,994	4,769,850	Clayton	366,451	9,267,968
Jasper	308,688	8,870,354	Clinton	396,406	12,964,845
Johnson	318,281	8,496,044	Delaware	287,409	8,200,888
Linn	323,956	10,364,525	Jasper	308,688	8,870,354
Mahaska	278,969	8,103,998	Linn	323,956	10,364,525
Marion	277,561	8,376,390	Marshall	238,554	6,863,379
Polk	226,738	6,667,664	Poweshiek	233,905	6,107,700
Scott	259,206	11,744,695	Tama	267,082	6,540,221
Warren	245,796	7,461,356	Winneshiek	347,528	8,119,041
Total	3,417,109	107,008,877	Total	3,612,764	100,137,185

Coming to Missouri, a corn-growing State, it is found that wheat is a less prominent industry, and that most of the counties showing the largest production of corn also present the largest yields of wheat, and that each of the counties above the wheat minimum of 250,000 bushels produces two or three times as much corn as wheat. In fact, there is no marked segregation of the two industries. Making two lists of nine counties each, several of the counties are in both, and the remainder show little cause for separation, the averages of total valuation differing by only six cents per acre—a result which furnishes valuable negative testimony in the same direction—giving an example of equality in value where the assumed cause of marked inequality is absent.

There is one other State, Indiana, in some few portions of which these two industries are segregated as in parts of Illinois and Iowa. Of counties yielding each in 1869 not less than 1,500,000 bushels of corn there are eight, and as many growing 500,000 bushels each of wheat. Four of these are in both lists, and are thrown out, leaving the remaining four in each marked examples, to show a still more positive discrepancy if a similar result shall follow as in the cases of Iowa and Illinois. These four corn counties produced in 1861 four times the amount of maize grown in the four wheat counties; and the wheat counties yielded a considerably larger number of bushels of wheat than of corn in a State which usually produces from three to four times as much corn as wheat. The valuation is that of the State in 1869, as follows:

Corn counties.	Acres.	Value.	Value per acre.
Bartholomew	247,923	$4,744,909	$19 13
Decatur	229,372	5,727,706	24 89
Hendricks	234,463	7,116,055	27 87
Knox	307,724	3,861,258	10 43
Total	1,019,482	21,449,228	21 03

Wheat counties.	Acres.	Value.	Value per acre.
Carroll	230,625	$3,955,670	$12 58
Elkhart	290,894	6,407,470	22 02
Kosciusko	334,898	4,495,280	13 42
La Porte	365,989	5,332,744	13 05
Total	1,222,406	20,191,164	16 51

The average values in this case are respectively $21.03 and $16.51 per acre, the corn area having a value 27 per cent. higher.

The result of this investigation cannot fail to enforce the conviction, long since forced upon the minds of intelligent farmers, that however profitable apparently to-day the selling from the farm of its principal products, the ultimate result is decline in yield and reduction of value. Genesee County in New York was long an example of great prominence in wheat-culture, which has been for many years declining, until, in 1869, only 22,374 bushels were reported where 301,144 bushels were harvested ten years previously. Many have mourned this decline as a great disaster, but the substitution of more profitable crops has wrought no serious

injury to Genesee farmers, whose lands are valued in the recent census at $75.86 per acre, instead of $49.81 in the former census, a gain of 52 per cent., while the average for the State of New York has increased from $38.30 to $57.35, an average of 49 per cent. The more thorough and impartial similar local investigations are made, doubtless the more positive and convincing will be the testimony, teaching, not that wheat-culture is unprofitable and should everywhere be abandoned, but that feeding crops upon the farm, which cannot be done in exclusive wheat-culture, is the only safe and ultimately profitable system to pursue, and a golden rule of agriculture.

FLUCTUATIONS OF YIELD AND AREA.

Any assumption of probable production based only on a medium product and average area in cultivation must generally be fallacious. It is not uncommon to find an increase in area of 30 or even 50 per cent. in a given crop of a State, or to witness a similar decline in breadth of cultivation. The rate of yield is equally fluctuating. There may be a yield of five bushels of wheat per acre one year, and ten, or perhaps fifteen, the next. Such being the facts, a careless general view of crop conditions is utterly worthless as an indication of the amount of production at the harvest. Only the most accurate local reports, combined with reference to the breadth of cultivation and degree of fertility of the several counties of a State, can be relied on for approximate correctness. At best these difficulties are sufficiently discouraging to any one who would attempt the business of interpreting crop reports, however numerous, systematic, and thorough they may be.

To illustrate this idea, reference is had to the assessors' returns of Ohio, which are probably nearer to completeness and accuracy than those of any other State; they have also been continued for a longer consecutive period. They show that in fifteen years the extremes of average yield of wheat were 4.5 bushels per acre in 1862 and 15.3 in 1869. Suppose the former crop had been grown in the latter year, sage dabblers in statistics would mourn the decline of wheat-culture in the ten years past rather than boast of its increase. The average for this period is nearly 11 bushels, and each of the six years between 1867 and 1872 had harvests above this average, though fluctuating annually in yield from a fraction of a bushel to four bushels; and six of the nine preceding crops were below this average, the exceptions being in 1860, 1862, and 1863. The area in the first year of this period of fifteen was a few acres more than that of the last; the average was 1,677,211 acres, the smallest breadth 1,159,964 acres in 1869, the year following the yield of 4.5 bushels per acre, and the largest was 2,401,535 acres in 1862. In the first seven years the annual area was not only above the average, but increasing each year to the sixth year, when a decline of 25 per cent. followed in 1863, and continued each year until 1867, when the lowest point was reached, since which time the annual breadth has been quite near the average for the whole period, though reaching it only in 1869. With these fluctuations, both in area and yield, there is of course a chance for greater differences still in product; therefore we are not surprised to find a return of 5,824,747 bushels in 1866, and 29,916,518 in 1862, the next largest being the crop of 1869.

The rate of yield of corn for the same period has a range from 27 bushels per acre to 40.8. As with wheat, the yield has been of late above the general average of 33 bushels, falling below only in 1867 and 1869, since the year 1865, while for seven years previously only the crops

of 1860 and 1861 reached the average. The range of acreage is from 1,834,138 acres in 1858 to 2,682,165 in 1871. The next largest area was in 1859, 2,431,312 acres, then declining each year for six years, until the breadth of 1,932,305 is reached, afterwards varying little from 2,200,000 acres for four years, and then rising again. The smallest product was 50,863,582 in 1858, and the largest 103,053,234 bushels in 1872. The largest fluctuation was 26,121,953 bushels, or 42 per cent. increase from 1869 to 1870. The small crop of the census year in other States, as in Ohio, has deceived superficial thinkers in statistics—*i. e.*, nearly everybody—into the belief that corn-growing has greatly declined; and yet the average of the past eight years in Ohio is 80,183,152 bushels per annum, and for the preceding seven years 65,353,572 bushels; and the average yields per acre for these periods respectively are 35.9 and 30.4 bushels, or 18 per cent. increase.

The rate of yield in wheat has been very unequal. A marked contrast is made by separating the past six years from the preceding nine. The latter period has far exceeded the productiveness of the former, the average yields per acre being, respectively, 12.4 and 10 bushels, an increase of 2.4 bushels. These differences were largely the result of unpropitious seasons. It is possible that lack of labor during the years of the war and less of thoroughness in culture may have aided in producing these low averages. After 1861 the yield of corn was yearly diminished until 1865; of wheat, after 1862, (sown in 1861,) until 1866. The acreage of both also declined through the same period, though that of wheat did not begin to fall till 1862.

The following tables give the details of this information, compiled from the official reports of Ohio:

Years.	Corn.			Wheat.		
	Acres.	Bushels.	Yield per acre.	Acres.	Bushels.	Yield per acre.
1858	1,834,138	50,863,582	27.7	1,695,412	17,655,483	10.0
1859	2,431,312	68,730,846	29.5	1,780,543	13,347,967	7.0
1860	2,397,639	91,588,704	38	1,844,667	23,640,356	13
1861	2,266,129	74,858,878	33	1,934,002	20,055,494	10.5
1862	2,120,544	62,764,887	30	2,401,535	29,916,518	12
1863	2,027,811	54,614,617	27	1,811,278	20,452,410	11.5
1864	1,938,616	54,053,491	27	1,665,495	15,541,385	9.3
1865	1,932,305	68,053,608	35	1,451,720	13,234,139	9
1866	2,248,093	80,386,320	36.5	1,295,539	5,824,747	4.5
1867	2,183,790	63,875,064	29.8	1,159,964	13,350,736	11.5
1868	2,232,301	76,725,288	34.3	1,456,734	16,480,059	11.3
1869	2,201,357	62,443,346	28.3	1,723,749	26,499,729	15.3
1870	2,360,189	88,565,299	37.5	1,658,664	18,726,341	11.2
1871	2,682,165	98,363,060	36.6	1,667,659	22,274,378	13.2
1872	2,520,253	103,053,234	40.8	1,611,217	18,027,664	11.2
Average	2,225,169	73,262,682	32.9	1,677,218	18,339,150	109.9

The yield of oats averages about 25½ bushels, and has been greater in the later years than in the earlier part of the period. In 1858 the average was 12 bushels, which became 23 the next year, and 30 in 1860. The area has also been increasing in recent years.

The fluctuations in the yield of rye are about equal to those seen in the wheat-crop. The average yield, about 10 bushels, is actually less than that of wheat. The year of failure in wheat, 1866, shows a rye average of about 8 bushels, while 1859 gives the lowest, 5.7 bushels. The area has a wide range, from 25,166 acres in 1872 to 108,609 in 1867, the year after the wheat failure, affording another instance of the ex-

treme sensitiveness of farmers to the suggestions of price of products and rate of production.

Years.	OATS.			RYE.		
	Acres.	Bushels.	Yield per acre.	Acres.	Bushels.	Yield per acre.
1858	669, 147	8, 026, 251	12	90, 191	874, 558	9. 6
1859	643, 613	15, 048, 910	23	96, 968	554, 258	5. 7
1860	830, 104	25, 127, 724	30	94, 394	1, 078, 764	11. 4
1861	728, 722	17, 798, 794	24	69, 374	779, 829	11. 2
1862	574, 820	11, 802, 470	20	57, 381	823, 291	14. 3
1863	548, 019	11, 317, 561	20	32, 257	305, 939	9. 4
1864	606, 738	14, 579, 295	24	48, 561	503, 316	10. 3
1865	690, 740	17, 586, 664	25	87, 289	910, 518	10. 4
1866	770, 206	21, 856, 564	28	77, 947	622, 333	7. 9
1867	766, 607	18, 534, 222	24	108, 609	1, 025, 291	9. 4
1868	798, 573	19, 058, 852	23	87, 899	815. 666	9. 3
1869	836, 564	24, 417, 799	29. 1	76, 436	852, 722	11. 2
1870	927, 160	24, 819, 908	26. 8	35, 101	331, 196	9. 4
1871	1, 000, 122	32, 696, 127	32. 6	37, 207	428, 014	11. 5
1872	971, 494	25, 825, 742	26. 5	25, 166	295, 843	11. 7
Average	757, 509	19, 233, 126	25. 3	68, 319	680, 104	9. 9

The attention of the reader is called to the extraordinary fluctuations in area, as well as material differences in the rate of production, in the minor crops, such as barley, buckwheat, &c. Buckwheat is mainly a supplementary crop, put in to ward off anticipated scarcity, or when the season has been unpropitious for sowing the standard grains. This accounts for an area of 14,972 acres in one year, and 149,445 in another. Barley is dependent upon the vicissitudes of the season and the beer business:

Years.	BARLEY.			BUCKWHEAT.		
	Acres.	Bushels.	Yield per acre.	Acres.	Bushels.	Yield per acre.
1858	125, 745	2, 103, 199	16. 72	71, 282	791, 921	11. 11
1859	101, 670	1, 623, 548	15. 97	149, 445	3, 042, 176	20. 22
1860	102, 730	1, 548, 477	21	66, 827	763, 939	11. 43
1861	60, 514	1, 255, 049	21	51, 389	696, 623	13. 55
1862	59, 128	1, 222, 041	22	20, 907	179, 135	8. 56
1863	74, 348	1, 329, 251	18	24, 846	225, 858	9. 09
1864	117, 453	2, 337, 213	21. 25	71, 045	965, 679	13. 58
1865	133, 040	2, 419, 900	17	33, 625	831, 985	24. 74
1866	82, 637	1, 353, 955	14	103, 982	1, 292, 415	12. 42
1867	84, 131	1, 604, 179	19	57, 873	590, 245	10. 19
1868	40, 021	815, 788	20. 38	51, 232	562, 256	10. 97
1869	72, 847	1, 689, 416	23. 18	28, 948	223, 766	7. 70
1870	78, 976	1, 502, 007	19	24, 426	287, 643	11. 77
1871	81, 252	1, 941, 240	23. 89	14, 972	177, 938	11. 88
1872	72, 483	1. 528, 266	21. 08	34, 882	266, 807	7. 65
Average	85, 798	1, 618, 235	18. 86	53, 712	726, 572	13. 52

The potato-crop is comparatively uniform in area, yet there is a difference of 50 per cent. between the smallest and largest breadth; and it is still more uniform in rate of yield, exhibiting averages quite as low in the period before the advent of the potato-beetle as in that since its arrival. "Eternal vigilance" and Paris green have kept up the full average of the entire period.

Years.	Potatoes.			Sorghum.		
	Acres.	Bushels.	Yield per acre.	Acres.	Pounds sugar.	Gallons molasses.
1860	96, 254	9, 365, 386	98			
1861	80, 949	6, 556, 901	80	....	....	....
1862	75, 367	5, 169, 327	70	30, 872	27, 216	2, 700, 071
1863	80, 785	5, 297, 498	66	31, 255	27, 359	2, 347, 578
1864	81, 972	6, 811, 055	83	29, 392	29, 542	2, 655, 332
1865	70, 515	4, 827, 354	66	37, 042	67, 068	3, 963, 751
1866	94, 226	6, 725, 577	71	43, 101	55, 147	4, 696, 089
1867	87, 149	5, 744, 530	65	17, 804	20, 094	1, 255, 866
1868	103, 287	7, 449, 247	72	25, 258	28, 668	2, 004, 055
1869	118, 862	10, 274, 605	86. 4	53, 317	30, 353	1, 777, 100
1870	87, 787	6, 121, 590	69. 7	23, 450	21, 988	2, 186, 673
1871	100, 630	8, 755, 193	87	23, 072	25, 505	1, 817, 042
1872	105, 896	7, 832, 297	73. 9	12, 932	34, 599	968, 130
Average	91, 052	6, 994, 658	76. 8	29, 772	33, 413	2, 397, 426

A study of the fluctuations exhibited in these tables will serve to moderate the pretensions of superficial crop-reporters; and a comparison of the results of State and national enumerations, as given below, will reveal the imperfections of an official census. The average product for fifteen years, being but two-thirds the yield of 1869 in wheat, and almost 10 per cent. higher than that of corn for the same year, may serve to correct the prevalent error relative to those crops arising from the partial failure of the one and remarkably high condition of the other in the census year.

		1859.	1869.	Average, 15 years.
Assessors' returns	corn	68, 730, 846	62, 443, 346	73, 262, 682
Census returns		73, 543, 190	67, 501, 144	
Assessors' returns	wheat	13, 347, 967	26, 499, 729	18, 339, 156
Census returns		14, 487, 351	27, 882, 159	
Assessors' returns	oats	15, 048, 910	24, 417, 799	19, 233, 126
Census returns		13, 472, 742	25, 347, 549	
Assessors' returns	rye	554, 258	852, 722	680, 104
Census returns		425, 918	846, 890	
Assessors' returns	barley	1, 623, 548	1, 689, 416	1, 618, 235
Census returns		1, 663, 868	1, 715, 221	
Assessors' returns	buckwheat	3, 042, 176	223, 766	726, 572
Census returns		2, 370, 650	180, 341	

FARM VALUES.

The following tables are, in part re-arrangements of, in part deductions from, the figures of the census of 1870, prepared for purposes of reference and investigation:

Value of farm property.

States and Territories.	Value of farms.	Value of farm implements.	Value of live-stock.	Total value.	Value per capita. Of population.	Value per capita. Of persons engaged in agriculture.
United States	$9, 262, 803, 861	$336, 878, 429	$1, 525, 276, 457	$11, 124, 958, 747	$285 80	$1, 878
Maine	102, 961, 951	4, 809, 118	23, 357, 129	131, 128, 193	209 16	1, 599
New Hampshire	80, 589, 313	3, 459, 943	15, 246, 545	99, 295, 801	311 96	2, 132
Vermont	139, 367, 075	5, 250, 279	23, 888, 835	168, 506, 189	530 77	2, 911
Massachusetts	116, 432, 784	5, 000, 879	17, 049, 228	138, 482, 891	95 02	1, 902
Rhode Island	21, 574, 968	786, 246	3, 135, 132	25, 496, 346	117 30	2, 164
Connecticut	124, 241, 382	3, 246, 599	17, 545, 038	145, 033, 019	269 85	3, 322
New York	1, 272, 857, 766	45, 997, 712	175, 882, 712	1, 494, 738, 190	341 05	3, 993
New Jersey	257, 523, 376	7, 887, 991	21, 443, 463	286, 854, 830	316 58	4, 544
Pennsylvania	1, 043, 481, 582	35, 658, 196	115, 647, 075	1, 194, 786, 853	339 24	4, 594
Delaware	46, 712, 870	1, 201, 644	4, 257, 323	52, 171, 837	417 32	3, 267
Maryland	170, 369, 684	5, 268, 676	18, 433, 698	194, 072, 058	248 50	2, 412
Virginia	213, 020, 845	4, 924, 036	28, 187, 669	246, 132, 550	200 90	1, 006
North Carolina	78, 211, 083	4, 082, 111	21, 993, 967	104, 287, 161	97 53	387
South Carolina	44, 808, 763	2, 282, 946	12, 443, 510	59, 535, 219	84 37	288
Georgia	94, 559, 468	4, 614, 701	30, 156, 317	129, 330, 486	109 22	385
Florida	9, 947, 920	505, 074	5, 212, 157	15, 664, 521	83 43	369
Alabama	67, 739, 036	3, 286, 924	26, 690, 095	97, 716, 055	98 01	335
Mississippi	81, 716, 576	4, 456, 633	29, 940, 238	116, 113, 447	140 24	448
Louisiana	68, 215, 421	7, 159, 333	15, 929, 188	91, 303, 942	125 74	645
Texas	60, 149, 950	3, 396, 793	37, 425, 194	100, 971, 937	123 50	605
Arkansas	40, 029, 698	2, 237, 409	17, 222, 506	59, 489, 613	122 79	544
Tennessee	218, 743, 747	8, 199, 487	55, 084, 075	282, 027, 309	224 09	1, 056
West Virginia	101, 604, 381	2, 112, 937	17, 175, 420	120, 892, 738	273 50	1, 634
Kentucky	311, 238, 916	8, 572, 896	66, 287, 343	383, 099, 155	290 00	1, 467
Ohio	1, 054, 465, 226	25, 692, 787	120, 300, 528	1, 200, 458, 541	450 41	3, 023
Michigan	398, 240, 578	13, 711, 979	49, 809, 869	461, 762, 426	389 98	2, 466
Indiana	634, 804, 189	17, 676, 591	83, 776, 782	736, 257, 562	438 08	2, 760
Illinois	920, 506, 346	34, 576, 587	149, 756, 698	1, 104, 839, 631	395 62	2, 935
Wisconsin	300, 414, 064	14, 239, 364	45, 310, 882	359, 964, 310	341 31	2, 254
Minnesota	97, 847, 442	6, 721, 120	20, 118, 841	124, 687, 403	283 57	1, 659
Iowa	392, 662, 441	20, 509, 582	82, 987, 133	496, 159, 156	415 53	2, 360
Missouri	392, 908, 047	15, 596, 426	84, 285, 273	492, 789, 746	236 29	1, 867
Kansas	90, 327, 040	4, 053, 312	23, 173, 185	117, 553, 537	322 50	1, 605
Nebraska	30, 242, 186	1, 549, 716	6, 551, 185	38, 343, 187	311 75	1, 659
California	141, 240, 028	5, 316, 690	37, 964, 752	184, 521, 470	329 36	3, 855
Oregon	22, 352, 989	1, 293, 717	6, 828, 675	30, 475, 381	335 18	2, 300
Nevada	1, 485, 505	163, 718	1, 445, 449	3, 094, 672	72 83	1, 495
Dakota	2, 085, 265	142, 612	779, 952	3, 007, 829	212 10	1, 192
Montana	729, 193	145, 438	1, 818, 693	2, 693, 324	130 78	1, 275
Idaho	492, 860	59, 295	520, 580	1, 072, 735	71 52	734
Washington	3, 978, 341	280, 551	2, 103, 343	6, 371, 235	265 97	1, 689
Wyoming	18, 187	5, 723	441, 795	465, 705	51 07	2, 822
Colorado	3, 385, 748	272, 604	2, 871, 102	6, 529, 454	163 79	1, 010
Utah	2, 297, 922	291, 390	2, 149, 814	4, 739, 126	54 61	454
Arizona	161, 340	20, 105	143, 996	325, 441	33 70	253
New Mexico	2, 260, 139	121, 114	2, 389, 157	4, 770, 410	51 92	255
District Columbia	3, 800, 230	39, 450	114, 916	3, 954, 596	30 03	2, 897

Value of farm productions.

States and Territories.	Total value.	Per acre of improved land.	Per capita of population.	Per capita of farming population.
Maine	$33, 470, 044	$11 47	$53 00	$403 00
New Hampshire	22, 473, 547	9 63	70 00	482 00
Vermont	34, 647, 027	11 27	104 00	597 00
Massachusetts	32, 192, 378	18 54	22 00	412 00
Rhode Island	4, 761, 163	16 47	21 00	404 00
Connecticut	26, 482, 150	16 08	49 00	606 00
New York	253, 526, 153	16 22	57 00	677 00
New Jersey	42, 725, 198	21 62	47 00	676 00
Pennsylvania	183, 946, 027	15 97	52 00	707 00
Delaware	8, 171, 667	11 70	65 00	511 00
Maryland	35, 343, 927	12 13	45 00	439 00
Virginia	51, 774, 801	6 34	42 00	211 00
North Carolina	57, 845, 940	11 00	54 00	214 00
South Carolina	41, 909, 402	13 92	59 00	202 00
Georgia	80, 390, 228	11 77	68 00	239 00
Florida	8, 909, 746	12 10	47 00	209 00
Alabama	67, 522, 335	13 34	67 00	231 00
Mississippi	73, 137, 953	17 37	88 00	282 00
Louisiana	52, 006, 622	25 42	71 00	367 00
Texas	49, 185, 170	16 59	60 00	294 00
Arkansas	40, 701, 699	21 88	84 00	372 00
Tennessee	86, 472, 847	12 63	60 00	323 00
West Virginia	24, 370, 692	9 06	52 00	316 00
Kentucky	87, 477, 374	10 79	66 00	335 00
Ohio	198, 256, 907	13 70	74 00	499 00
Michigan	81, 508, 623	15 99	68 00	435 00
Indiana	122, 914, 302	12 16	73 00	460 00
Illinois	210, 860, 585	10 91	83 00	560 00
Wisconsin	78, 027, 032	13 23	74 00	488 00
Minnesota	33, 446, 400	14 40	78 00	445 00
Iowa	114, 386, 441	12 17	95 00	544 00
Missouri	103, 035, 759	11 28	59 00	390 00
Kansas	27, 630, 651	14 02	75 00	377 00
Nebraska	8, 604, 742	13 30	70 00	372 00
California	49, 856, 024	8 02	89 00	1, 041 00
Oregon	7, 123, 790	6 38	78 00	537 00
Nevada	1, 659, 713	17 91	39 00	801 00
Arizona	277, 998	19 06	28 00	216 00
Colorado	2, 335, 106	24 43	58 00	361 00
Dakota	495, 657	11 62	34 00	196 00
District of Columbia	319, 517	38 65	2 00	234 00
Idaho	637, 797	23 97	42 00	436 00
Montana	1, 676, 660	19 80	81 00	794 00
New Mexico	1, 905, 060	13 32	20 00	102 00
Utah	1, 973, 142	16 61	22 00	189 00
Washington	2, 111, 902	11 00	68 00	560 00
Wyoming	42, 760	126 51	4 00	259 00

SHEEP AND WOOL.

The estimated number of sheep, on the 1st of January, 1874, was 34,038,200, and the annual product of wool for 1873 may be placed at about 146,000,000 pounds. The wool-manufacture requires a constantly increasing amount of raw material. The imports of eleven years, from 1861 to 1871 inclusive, amounted to 572,647,377 pounds of wool, (exclusive of shoddy,) an average of 52,058,843 pounds, costing (in gold at port of shipment,) $89,375,908, or $8,125,082 per annum. The imports of 1872 were 122,256,499 pounds, costing $26,214,195, and those of 1873, 85,496,049 pounds, valued at $20,433,938. At the same time the imports of woolens, which had for eleven years an average gold value of $33,099,301, amounted in 1872 to $52,408,921, and in 1873 to $51,075,492.

The business of wool-growing scarcely "holds its own" east of the Mississippi, but is increasing from the Missouri to the Pacific coast, upon plains and in the mountains, though in settled parts of Nebraska the lack of fences is a check.

Statement of sheep and wool production of the principal countries in the world.

Countries.	Millions sheep and lambs.	Millions pounds wool produced.	Value of wool.	Price per pound.	Years.	Millions sheep and lambs.
United States	32.8	117.6	$70,525	$0 51	1874	*34
Great Britain	34.1	160	39,990	25	1873	29.4
Ireland	......	....	....	......	1873	4.4
Russia	45.3	90.8	18,885	21	†1859–'63	45.1
Sweden	1.6	6.1	1,140	19	1871	1.6
Norway	1.7	6.4	1,125	17	1865	1.7
Denmark	1.9	7	1,610	23	1871	1.8
Germany	25.3	52.1	21,700	41	....	......
Prussia	......	....	....	......	1872	1.5
Würtemberg	......	....	....	......	1872	.5
Bavaria	......	....	....	......	1863	2
Saxony	......	....	....	......	1867	.3
Holland	1	6.2	1,155	18	1871	.8
Belgium	6	3.5	655	18	1866	.5
France	30.4	91.2	17,040	19	1872	24.7
Portugal	......	....	....	......	....	2.4
Spain	22.1	74.4	31,010	42	1865	22
Italy	11	24.8	5,175	21	1867	11
Austria	16.6	31.1	11,655	37	1871	5
Hungary	......	....	....	......	1871	15
Switzerland	4	1.3	250	19	1866	.4
Greece	2.5	7.6	1,110	14	1867	2.5
Australia	37.4	152.2	56,780	37	1873	40.6
Tasmania	1.7	6.1	2,370	39	1873	1.3
New Zealand	8.4	28.8	7,820	27	1871	9.7
Cape of Good Hope	10	38	12,665	33	1865	9.8
	289	964.6	302,660	......	....	......

*Sheep. †Average for 5 years.

The first two columns give the estimate of the London Statistical Society in 1866; the last column is the latest official statement of the same countries.

STATISTICS OF MANUFACTURES OF WOOL.

Number of establishments, of hands employed, and of sets of cards.

States and Territories.	Establishments.			Hands employed.			Number of sets of cards.	
	1870.	1860.	1850.	1870.	1860.	1850.	1870.	1860.
Alabama	14	6	....	41	198	....	24	14
Arkansas	13	....	....	31	....	....	17	....
California	5	1	....	659	60	....	46	6
Connecticut	108	84	149	7, 297	3, 767	5, 488	660	265
Delaware	11	4	8	399	114	140	30	8
District of Columbia	....	....	1	....	....	2	....	....
Florida	1	....	....	1	....	....	1	....
Georgia	46	11	3	563	383	78	72	30
Illinois	109	21	16	1, 736	162	178	250	37
Indiana	175	79	33	2, 469	533	246	346	112
Iowa	85	12	1	1, 068	120	7	199	13
Kansas	9	....	....	91	....	....	21	....
Kentucky	125	37	25	683	437	318	208	83
Louisiana	2	1	....	29	60	....	12	4
Maine	107	26	36	3, 042	1, 027	624	331	60
Maryland	31	27	38	397	381	362	60	44
Massachusetts	185	134	119	20, 550	12, 969	11, 130	1, 367	821
Michigan	54	16	15	667	126	129	116	14
Minnesota	10	....	....	146	....	....	19	....
Mississippi	11	4	....	116	235	....	17	13
Missouri	156	11	1	718	70	25	258	15
New Hampshire	77	51	61	3, 750	1, 518	2, 127	351	146
New Jersey	20	35	41	1, 094	835	898	81	61
New Mexico	1	....	....	20	....	....	1	....
New York	252	140	249	8, 812	4, 220	6, 674	845	324
North Carolina	52	7	1	249	253	30	78	23
Ohio	223	115	130	2, 243	728	1, 201	334	173
Oregon	9	1	....	179	30	....	21	4
Pennsylvania	457	270	380	12, 764	6, 088	5, 726	1, 317	483
Rhode Island	65	57	45	6, 363	4, 229	1, 758	474	253
South Carolina	15	1	....	53	92	....	25	10
Tennessee	148	1	4	428	10	17	177	1
Texas	20	2	1	100	43	8	29	4
Utah	15	....	....	106	....	....	19	....
Vermont	65	46	72	1, 870	2, 073	1, 393	175	99
Virginia	68	45	121	278	494	668	116	50
West Virginia	74	....	....	316	....	....	132	....
Wisconsin	64	15	9	775	105	25	134	19
Total	2, 891	1, 260	1, 559	80, 053	41, 360	39, 252	8, 336	3, 209

Quantity and value of wool and other material used.

States and Territories.	Wool used.				Value of all material.		
	Domestic, 1870.	Foreign, 1870.	1860.	1850.	1870.	1860.	1850.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Dollars.*	*Dollars.*	*Dollars.*
Alabama	196,500		264,435		57,333	86,799	
Arkansas	115,330				55,782		
California	1,928,000		400,000		608,141	50,000	
Connecticut	15,798,547	3,025,272	7,179,819	9,414,100	11,020,825	4,043,124	3,325,709
Delaware	583,732	12,455	140,000	393,000	392,614	75,807	204,172
District of Columbia				5,000			1,630
Florida	550				150		
Georgia	620,987		1,008,600	153,816	268,176	260,475	30,392
Illinois	3,560,829		324,300	396,964	1,701,323	110,402	115,367
Indiana	4,949,461	80,157	940,000	413,350	2,684,315	352,302	120,486
Iowa	2,273,428		168,700	14,500	998,073	67,293	3,500
Kansas	200,000				86,105		
Kentucky	1,639,367		1,452,500	673,900	831,628	510,902	205,287
Louisiana	50,325		69,150		19,047	31,300	
Maine	7,338,501	382,727	2,414,300	1,438,434	3,958,759	1,003,366	495,940
Maryland	500,291	450	1,055,272	430,300	233,924	267,355	165,568
Massachusetts	37,146,190	7,201,248	33,516,797	22,229,952	24,876,318	12,520,675	8,671,671
Michigan	1,391,889		163,100	162,250	659,700	69,010	43,402
Minnesota	254,857				108,540		
Mississippi	154,790		270,597		77,566	119,849	
Missouri	1,979,671		191,400	80,000	849,313	56,745	16,000
New Hampshire	8,785,882	793,433	3,829,404	3,604,103	5,310,622	1,612,578	1,267,329
New Jersey	2,191,178	92,240	1,175,800	1,510,289	1,215,016	548,578	548,367
New Mexico	50,000				12,775		
New York	16,146,873	898,447	7,453,004	12,538,786	8,535,316	3,424,614	3,838,292
North Carolina	255,693		504,500	30,000	166,497	151,005	13,950
Ohio	3,910,034	62,200	1,190,751	1,657,726	1,968,629	476,833	578,423
Oregon	943,400		150,000		227,595	27,000	
Pennsylvania	21,349,389	3,214,850	7,128,529	7,560,379	17,457,913	4,427,138	3,232,718
Rhode Island	12,249,720	412,247	6,832,600	4,103,370	8,089,948	4,070,224	1,463,900
South Carolina	55,696		250,000		22,238	60,000	
Tennessee	1,030,153		10,000	6,200	503,737	5,225	1,675
Texas	278,045		81,900	30,000	86,817	25,980	10,000
Utah	276,000				98,272		
Vermont	3,470,667	1,120,680	4,047,010	2,328,100	1,937,370	1,662,650	830,684
Virginia	741,000	1,200	1,131,000	1,554,110	317,800	389,264	488,899
West Virginia	673,003				307,051		
Wisconsin	1,627,169	14,218	265,000	134,200	685,368	85,743	32,630
Total	154,767,095	17,311,824	83,608,468	70,862,829	96,432,601	36,586,287	25,755,991

Quantity and value of all products of woolens manufactured.

States and Territories.	PRODUCTS.				VALUE OF ALL PRODUCTS.		
	Cloth, cassimeres, and Doeskins.	Flannels.	Jeans.	Yarn.	1870.	1860.	1850.
	Yards.	*Yards.*	*Yards.*	*Pounds.*	*Dollars.*	*Dollars.*	*Dollars.*
Alabama	....	....	....	107, 800	89, 998	191, 474	....
Arkansas	....	....	....	....	78, 690	....	....
California	231, 260	278, 501	....	....	1, 102, 754	150, 000	....
Connecticut	10, 637, 028	1, 563, 000	1, 280, 000	461, 550	17, 371, 048	6, 840, 220	6, 465, 216
Delaware	276, 332	750	590, 000	20, 500	576, 067	153, 035	251, 000
District of Columbia	....	....	....	....	....	....	2, 400
Florida	....	....	....	....	500	....	....
Georgia	119, 574	....	177, 155	40, 000	471, 523	464, 420	88, 750
Illinois	663, 498	1, 219, 642	813, 573	549, 088	2, 849, 249	187, 613	206, 572
Indiana	727, 504	1, 672, 774	2, 103, 086	709, 517	4, 329, 711	649, 771	205, 802
Iowa	483, 199	509, 044	106, 959	339, 485	1, 647, 606	127, 640	13, 000
Kansas	22, 380	19, 000	28, 380	40, 000	158, 150	....	....
Kentucky	41, 585	63, 232	1, 244, 578	21, 440	1, 312, 458	845, 226	318, 819
Louisiana	....	....	....	....	30, 795	45, 200	....
Maine	1, 983, 656	2, 019, 729	....	8, 600	6, 398, 881	1, 717, 007	753, 300
Maryland	64, 490	31, 327	4, 610	72, 100	427, 596	605, 992	295, 140
Massachusetts	21, 819, 879	22, 321, 084	....	1, 235, 161	39, 502, 542	19, 655, 787	12, 770, 565
Michigan	668, 468	253, 028	1, 400	78, 174	1, 204, 868	139, 246	90, 242
Minnesota	105, 996	74, 190	....	9, 350	219, 862	....	....
Mississippi	....	....	....	2, 087	147, 323	158, 507	....
Missouri	94, 610	171, 200	137, 920	289, 525	1, 256, 213	143, 025	56, 000
New Hampshire	2, 481, 416	13, 141, 565	....	485, 000	8, 766, 104	2, 601, 653	2, 127, 745
New Jersey	138, 668	634, 746	126, 632	187, 100	1, 003, 825	1, 085, 104	1, 164, 446
New Mexico	5, 500	2, 000	2, 000	....	21, 000	....	....
New York	6, 427, 758	2, 175, 078	15, 000	564, 033	14, 394, 786	5, 870, 117	7, 030, 604
North Carolina	100, 000	1, 690	133, 452	....	298, 638	291, 000	23, 750
Ohio	469, 403	1, 464, 832	993, 926	689, 706	3, 287, 699	825, 000	1, 111, 027
Oregon	148, 095	334, 300	....	1, 000	505, 857	85, 000	....
Pennsylvania	3, 938, 277	6, 809, 565	14, 171, 662	7, 690, 889	27, 580, 586	8, 191, 675	5, 321, 866
Rhode Island	7, 483, 598	1, 025, 000	2, 187, 156	233, 500	12, 558, 117	6, 915, 205	2, 381, 825
South Carolina	....	....	13, 000	....	34, 459	80, 000	....
Tennessee	4, 158	3, 919	145, 692	79, 602	696, 844	8, 100	6, 310
Texas	10, 000	....	....	400	152, 968	38, 796	15, 000
Utah	11, 000	58, 630	4, 000	1, 000	199, 000	....	....
Vermont	1, 978, 007	2, 018, 533	....	6, 400	3, 619, 459	2, 938, 626	1, 579, 161
Virginia	276, 610	19, 235	3, 000	5, 800	488, 352	717, 827	841, 013
West Virginia	59, 623	135, 445	89, 306	116, 382	475, 763	....	....
Wisconsin	625, 940	343, 627	7, 478	105, 048	1, 250, 467	172, 720	87, 992
Total	63, 340, 612	58, 965, 286	24, 489, 985	14, 156, 237	155, 405, 358	61, 894, 986	43, 207, 505

Manufactures of wool on Pacific coast.

	1869.	1873.
Mills in California .... number..	5	8
Mills in Oregon .... do....	9	3
Spindles .... aggregate do....	8, 200	20, 840
Broad-looms .... aggregate do....	228	232
Capital .... dollars..	2, 171, 200	2, 000, 000
Total wool used last year .... pounds..	2, 871, 400	5, 380, 000
Value of the manufactures .... dollars..	1, 608, 611	3, 000, 000
Wool used, domestic .... pounds..	2, 871, 400	4, 880, 000
Wool used, foreign .... do....	....	500, 000
Cotton used .... do....	100, 000	250, 000
Cassimeres made .... yards..	379, 355	11, 000, 000
Hands employed .... number..	838	1, 358
Wages paid .... dollars..	342, 113	556, 400

TEXTILE FIBERS.

The following statement of production of various fibers, at three decennial enumerations, is compiled from census reports:

States and Territories.	Year.	Cotton.	Wool.	Hemp.	Flax.	Silk cocoons.
		Bales.	*Pounds.*	*Tons.*	*Pounds.*	*Pounds.*
Maine	1850	...	1,364,034	...	17,681	252
	1860	...	1,495,060	50	2,997	73
	1870	...	1,774,168	...	5,435	...
New Hampshire	1850	...	1,108,476	...	7,652	191
	1860	...	1,160,222	81	1,347	1
	1870	...	1,129,442	...	177	...
Vermont	1850	...	3,400,717	...	20,852	268
	1860	...	3,118,950	...	7,007	...
	1870	...	3,102,137	...	12,899	...
Massachusetts	1850	...	585,136	...	1,162	7
	1860	...	377,267	...	165	...
	1870	...	306,659	2	930	...
Rhode Island	1850	...	129,692	...	85	...
	1860	...	90,699	...	...	...
	1870	...	77,328	...	...	...
Connecticut	1850	...	497,454	...	17,928	328
	1860	...	335,896	3	1,187	18
	1870	...	254,129	...	300	...
New York	1850	...	10,071,301	4	940,577	1,774
	1860	...	9,454,474	5	1,518,025	259
	1870	...	10,599,225	6	3,670,818	...
New Jersey	1850	...	375,396	...	182,965	23
	1860	...	349,250	430	48,651	...
	1870	...	336,609	5	234,061	...
Pennsylvania	1850	...	4,481,570	44	530,307	285
	1860	...	4,752,522	46	312,368	163
	1870	...	6,561,722	571	815,906	1
Delaware	1850	...	57,768	...	11,174	...
	1860	...	50,201	...	8,112	...
	1870	...	58,316	...	878	...
Maryland	1850	...	477,438	63	35,686	39
	1860	...	491,511	272	14,481	3
	1870	...	435,213	...	30,760	...
Virginia	1850	3,947	2,860,765	139	1,000,450	517
	1860	12,727	2,510,019	15	487,808	225
	1870	183	877,110	31	130,750	7
North Carolina	1850	73,845	970,738	30	593,796	229
	1860	145,514	883,473	3,016	216,490	338
	1870	144,935	799,667	...	59,552	95
South Carolina	1850	300,901	487,233	...	333	123
	1860	353,412	427,102	1	344	20
	1870	224,500	156,314	...	...	...
Georgia	1850	499,091	990,019	...	5,837	813
	1860	701,840	946,227	31	3,303	72
	1870	473,934	846,947	...	983	14
Florida	1850	45,131	23,247	...	50	6
	1860	65,153	59,171	1	...	...
	1870	39,789	37,562	...	...	...
Alabama	1850	564,429	657,118	...	3,921	167
	1860	989,955	775,117	...	111	315
	1870	429,482	381,253	...	37	...
Mississippi	1850	484,292	559,619	7	665	2
	1860	1,202,507	665,959	...	50	10
	1870	564,938	288,285	3	100	31
Louisiana	1850	178,737	109,897	...	...	29
	1860	777,738	290,847	1	...	...
	1870	350,832	140,428	...	...	...

Textile fibers—Continued.

States and Territories.	Year.	Cotton.	Wool.	Hemp.	Flax.	Silk coons.
		Bales.	*Pounds.*	*Tons.*	*Pounds.*	*Pounds.*
Texas	1850	58, 072	131, 917	....	1, 048	22
	1860	431, 463	1, 493, 738	179	115	27
	1870	350, 628	1, 251, 328	5	25	....
Arkansas	1850	65, 344	182, 595	15	12, 291	38
	1860	367, 393	410, 382	447	3, 821	5
	1870	247, 968	214, 784	....	420	....
Tennessee	1850	194, 532	1, 364, 378	595	368, 131	1, 923
	1860	296, 464	1, 405, 236	2, 243	164, 294	71
	1870	181, 842	1, 389, 762	1, 033	80, 930	153
West Virginia	1870	2	1, 593, 541	37	82, 276	....
Kentucky	1850	758	2, 297, 433	17, 787	2, 100, 116	1, 281
	1860	....	2, 329, 105	39, 409	728, 234	340
	1870	1, 080	2, 234, 450	7, 777	237, 268	45
Ohio	1850	....	10, 196, 371	150	446, 932	1, 552
	1860	....	10, 608, 927	1, 212	882, 423	7, 394
	1870	....	20, 539, 643	25	17, 880, 624	....
Michigan	1850	....	2, 043, 283	....	7, 152	108
	1860	....	3, 960, 888	776	4, 123	12
	1870	....	8, 726, 145	....	240, 110	....
Indiana	1850	14	2, 610, 287	....	584, 469	387
	1860	....	2, 552, 318	4, 222	97, 119	575
	1870	3	5, 029, 023	22	37, 771	....
Illinois	1850	....	2, 150, 113	....	160, 063	47
	1860	1, 482	1, 989, 567	1, 502	48, 235	1, 545
	1870	465	5, 739, 249	174	2, 204, 606	....
Wisconsin	1850	....	253, 963	....	68, 393	....
	1860	....	1, 011, 933	356	21, 644	15
	1870	....	4, 090, 670	....	497, 398	....
Minnesota	1850	....	85	....	....	....
	1860	....	20, 388	109	1, 983	52
	1870	....	401, 185	....	122, 571	....
Iowa	1850	....	373, 898	....	62, 660	246
	1860	....	660, 858	651	30, 226	124
	1870	....	2, 967, 043	4	695, 518	....
Missouri	1850	....	1, 627, 164	16, 028	627, 160	186
	1860	41, 188	2, 069, 778	19, 267	109, 837	127
	1870	1, 246	3, 649, 390	2, 816	16, 613	3
Kansas	1860	61	24, 746	44	1, 135	40
	1870	7	335, 005	35	1, 040	....
Nebraska	1860	....	3, 302	9	....	120
	1870	....	74, 655	....	54	....
Oregon	1850	....	29, 686	....	640	....
	1860	....	219, 012	1	162	6
	1870	....	1, 080, 638	....	40, 474	....
California	1850	....	5, 520	....	....	....
	1860	....	2, 683, 109	....	....	....
	1870	34	11, 391, 743	200	31, 740	3, 587
Nevada	1860	....	330	....	....	....
	1870	106	27, 029	....	....	....
District of Columbia	1850	....	525	....	....	....
	1860	....	100	....	....	....
	1870	....	....	....	....	....
Dakota	1870	....	8, 810	....	....	....
Montana	1870	....	100	....	....	....
Idaho	1870	....	3, 415	....	....	....
Washington	1860	....	19, 819	....	....	....
	1870	....	162, 713	....	....	....
Wyoming	1870	....	30, 000	....	....	....

Textile fibers—Continued.

States and Territories.	Year.	Cotton.	Wool.	Hemp.	Flax.	Silk cocoons.
		Bales.	*Pounds.*	*Tons.*	*Pounds.*	*Pounds.*
Arizona	1870	....	679	....		....
Colorado	1870	....	204, 925	....	....	....
New Mexico	1850	....	32, 901	....	....	....
	1860	19	492, 645	....	....	....
	1870	....	684, 930	....	....	....
Utah	1850	....	9, 222	....	550	....
	1860	136	74, 765	114	4, 343	....
	1870	22	109, 018	....	10	....
Total	1850	2, 469, 093	52, 516, 959	34, 871	7, 709, 676	10, 843
	1860	5, 387, 052	60, 264, 913	74, 493	4, 720, 145	11, 944
	1870	3, 011, 996	100, 102, 387	12, 746	27, 133, 034	3, 937

STATISTICS OF SILK.

From the *Morus multicaulis* era to the present time the impulse to progress in silk-culture has been fitful and spasmodic. More recently the experiment has been tried in California, and until the production of silk-worm eggs for foreign markets became unprofitable, seemed reasonably successful. An experiment by a German colony has been initiated in Mississippi. But for the liability of injury or destruction of the worms by heavy thunder-storms, such attempts might bear better promise of favorable results. Such an industry is greatly needed to give employment to multitudes in the country who cannot do heavy farm-work, and might be pursued by thousands, with little capital, and no knowledge except that of the conditions necessary to the health and vigor of the worms. The product should, of course, be sold in the cocoon to the manufacturer.

The last census shows a falling off in the quantity of cocoons reported, as follows:

States.	1870.	1860.	1850.
	Pounds.	*Pounds.*	*Pounds.*
United States	3, 937	11, 994	10, 843
Alabama	....	315	167
Arkansas	....	5	38
California	3, 587	....	....
Connecticut	....	18	328
Georgia	14	72	813
Illinois	....	1, 545	47
Indiana	....	575	387
Iowa	....	124	246
Kansas	....	40	....
Kentucky	45	340	1, 281
Louisiana	1	....	29
Maine	....	73	252
Maryland	....	3	39
Massachusetts	....	....	7
Michigan	....	12	108
Minnesota	....	52	....
Mississippi	31	10	2
Missouri	3	127	186
Nebraska	....	120	....
New Hampshire	....	1	191
New Jersey	....	....	23
New York	....	259	1, 774
North Carolina	95	338	229
Ohio	....	7, 394	1, 552
Pennsylvania	1	163	285
South Carolina	....	20	123
Tennessee	153	71	1, 923
Texas	....	27	22
Vermont	....	....	268
Virginia	7	225	517
Wisconsin	....	15	....

The census shows a decrease in the number of silk-factories, but a decided increase in the quantity of goods manufactured. The material for manufacture is of course mainly imported. The record for 1870 is as follows:

States.	Establishments.	Looms.*	Hands employed.	Capital.	Wages.	Raw silk used.†	Value of materials.	Value of products.
	No.	No.	No.	Dollars.	Dollars.	Pounds.	Dollars.	Dollars.
Connecticut	23	255	1,703	1,414,130	569,425	175,839	2,049,834	3,314,845
Maryland								
Massachusetts	9	5	453	412,000	154,300	101,650	937,000	1,402,500
New Hampshire	1		15	5,000	1,600	2,000	14,350	25,000
New Jersey	28	496	2,790	2,166,500	625,816	259,727	2,678,161	3,998,964
New York	14	216	739	800,500	262,345	111,843	1,211,385	1,826,073
Ohio								
Pennsylvania	10	467	936	1,429,000	326,400	32,429	919,024	1,632,900
Vermont	1		13	4,000	2,400	1,000	7,805	10,380
Total	86	1,439	6,649	6,231,130	1,942,286	684,488	7,817,559	12,210,662

*In New Jersey 188 hand-looms were included.
†In addition, there is used in New Jersey 22,440 pounds of silk-yarn, and in Pennsylvania 26,016 pounds.

Similar statistics of 1860 are given in the following table:

States.	Establishments.	Hands employed.	Capital.	Wages.	Raw silk.	All materials.	Sewing silk and twist.	All products.
	No.	No.	Dollars.	Dollars.	Pounds.	Dollars.	Pounds.	Dollars.
Connecticut	22	1,137	997,900	155,700	151,191	821,807	145,835	1,301,400
Maryland	3	35	36,800	9,336		18,121		39,800
Massachusetts	20	781	330,700	191,720	89,000	814,970	63,900	1,297,050
New Hampshire	2	23	9,000	3,780	6,000	28,000	5,440	36,480
New Jersey	9	716	207,600	111,492	121,634	631,725	107,310	969,700
New York	44	1,159	323,960	268,624	29,140	644,911	25,444	1,154,296
Ohio	4	25	11,300	5,732		14,300		41,200
Pennsylvania	35	1,559	1,010,700	303,780	66,000	927,943	61,500	1,767,845
Vermont								
Total	139	5,435	2,926,980	1,050,224	462,965	3,901,777	409,429	6,607,771

In the decennial period the value of products has been nearly doubled. New Jersey has passed to the front rank in the manufacture, while Massachusetts and New York have made small advance.

Importation of silks—value.

Years.	Raw silk.*	Velvets.	Dress and piece goods.	Hosiery, shirts, and drawers.	Ribbons.	Other manufactures.	Total.
1854	$1,085,261		$25,296,519	$1,001,299		$10,007,129	$37,360,208
1855	742,251		20,069,957	459,093		4,980,711	26,252,012
1856	991,234		25,200,651	611,298		5,749,880	32,553,013
1857	953,734		22,067,369	839,299		6,473,997	30,334,299
1858	1,542,195		16,121,395	417,168		5,593,795	23,671,553
1859	1,619,157		21,182,188	460,034		6,437,844	29,699,223
1860	1,340,676		24,876,075	546,845		7,743,444	34,507,040
1861	1,211,050	$24,893	17,338,461	344,365		8,918,991	34,500,516
1862	489,526	557,219	4,306,605		$2,133,037	591,515	8,077,902
1863	1,018,468	717,655	6,457,512		4,822,471	893,122	13,909,228
1864	2,057,964	1,213,815	11,926,658		6,054,993	1,402,257	22,655,687
1865	1,348,790	461,820	3,606,601	205,737	2,541,812	1,526,682	10,324,779
1866	4,117,336	1,077,344	14,342,228		5,631,656	4,324,608	31,793,806
1867	2,804,325	1,889,244	8,101,665	126,597	4,639,753	4,625,625	22,274,209
1868	2,921,573	1,493,287	7,151,576	35,757	3,783,839	4,911,999	20,298,031
1869	3,318,496		10,916,898	44,931		11,371,771	25,652,096
1870	3,017,958		12,624,353	33,906		11,245,789	26,922,006
1871	5,739,592		18,209,742	186,397		13,944,862	38,080,593
1872	5,625,620		20,295,251	106,924		16,046,443	42,074,238
1873	6,460,621		17,609,435	54,168		12,326,266	36,450,490

*Including silk in the gum.

TRADE WITH BRITISH AMERICA.

The trade between the United States and the British North American Provinces, as reported by Hon. Edward Young, from the records of the Customs Bureau of the Treasury Department, has aggregated in fifty-three years $575,294,736 in imports, and $678,183,096 in exports, or $23,650,525 per annum in imports and exports together. For the first twelve years, commencing with 1821, the annual average was only $2,647,578; and for a subsequent period of thirteen years the yearly average was $5,450,553. The increase has been rapid since 1855. The period of thirteen years from 1854 to 1866 covers the reciprocity treaty, when the annual average rose to $48,422,355; yet the average has been still further increased in the period of seven years following that of reciprocity, being $59,351,614. It may be desirable for reference to reproduce the Treasury summary of merchandise and money imported and exported in these fifty-three years, as follows:

Value of the imports from the British North American Provinces to the United States, and of the exports to the same, for fifty-three years ending June 30, 1873.

Years.	IMPORTS.			EXPORTS.		
	Merchandise.	Specie and bullion.	Total.	Merchandise.	Specie and bullion.	Total.
1821	$401, 500	$89, 417	$490, 917	$2, 014, 529	....	$2, 014, 529
1822	368, 592	158, 225	526, 817	1, 898, 873	....	1, 898, 873
1823	244, 039	219, 740	463, 779	1, 827, 203	....	1, 827, 203
1824	482, 069	232, 075	714, 144	1, 782, 967	....	1, 782, 967
1825	400, 988	218, 896	619, 884	2, 556, 032	....	2, 556, 032
1826	431, 957	221, 994	653, 951	2, 126, 545	$462, 250	2, 588, 795
1827	290, 621	154, 497	445, 118	1, 809, 457	1, 021, 291	2, 830, 748
1828	267, 725	179, 944	447, 669	1, 547, 902	126, 772	1, 674, 674
1829	336, 305	241, 237	577, 542	2, 138, 656	626, 253	2, 764, 909
1830	398, 024	252, 279	650, 303	2, 749, 232	1, 037, 141	3, 786, 373
1831	587, 712	277, 197	864, 909	3, 079, 838	982, 000	4, 061, 838
1832	686, 781	542, 745	1, 229, 526	3, 343, 391	270, 994	3, 614, 385
1833	975, 513	817, 880	1, 793, 393	4, 100, 080	371, 004	4, 471, 084
1834	896, 380	652, 353	1, 548, 733	3, 134, 776	400, 500	3, 535, 276
1835	1, 237, 768	197, 400	1, 435, 168	3, 409, 105	638, 783	4, 047, 888
1836	1, 881, 097	546, 474	2, 427, 571	2, 586, 828	64, 438	2, 651, 266
1837	1, 910, 661	448, 602	2, 359, 263	2, 875, 861	413, 125	3, 288, 986
1838	1, 104, 858	450, 712	1, 555, 570	2, 293, 283	430, 208	2, 723, 491
1839	1, 723, 364	431, 782	2, 155, 146	3, 548, 154	15, 300	3, 563, 454
1840	1, 227, 596	780, 171	2, 007, 767	6, 088, 501	11, 500	6, 100, 001
1841	1, 492, 296	475, 891	1, 968, 187	6, 458, 463	198, 100	6, 656, 563
1842	993, 932	768, 069	1, 762, 001	6, 131, 233	59, 076	6, 190, 309
1843	454, 151	403, 545	857, 696	2, 638, 088	86, 334	2, 724, 422
1844	818, 471	647, 244	1, 465, 715	6, 205, 998	509, 905	6, 715, 903
1845	1, 105, 604	914, 461	2, 020, 065	5, 565, 131	489, 095	6, 054, 226
1846	1, 314, 674	623, 043	1, 937, 717	7, 154, 533	251, 900	7, 406, 433
1847	2, 005, 365	338, 562	2, 343, 927	7, 974, 928	10, 615	7, 985, 543
1848	2, 686, 319	960, 148	3, 646, 467	7, 826, 755	555, 900	8, 382, 655
1849	2, 409, 500	417, 380	2, 826, 880	7, 922, 767	181, 500	8, 104, 267
1850	5, 218, 093	426, 369	5, 644, 462	9, 515, 991	33, 044	9, 549, 035
1851	5, 279, 718	1, 413, 404	6, 693, 122	11, 780, 092	234, 831	12, 014, 923
1852	5, 469, 445	640, 854	6, 110, 299	10, 291, 166	217, 850	10, 509, 016
1853	6, 527, 559	1, 023, 159	7, 550, 718	12, 520, 882	619, 760	13, 140, 642
1854	8, 859, 412	68, 148	8, 927, 560	24, 073, 681	493, 179	24, 566, 860
1855	15, 118, 289	18, 445	15, 136, 734	27, 741, 808	64, 212	27, 806, 020
1856	21, 276, 614	33, 807	21, 310, 421	29, 025, 349	4, 000	29, 029, 349
1857	22, 108, 915	15, 380	22, 124, 295	24, 146, 482	116, 000	24, 262, 482
1858	15, 784, 836	21, 683	15, 806, 519	23, 604, 526	47, 201	23, 651, 727
1859	19, 287, 565	439, 986	19, 727, 551	28, 109, 494	44, 680	28, 154, 174
1860	23, 572, 796	278, 585	23, 851, 381	22, 695, 928	10, 400	22, 706, 328
1861	23, 041, 602	21, 331	23, 062, 933	22, 676, 513	69, 100	22, 745, 613
1862	18, 820, 801	479, 194	19, 299, 995	20, 573, 070	506, 045	21, 079, 115
1863	17, 484, 786	6, 536, 478	24, 021, 264	27, 619, 814	3, 661, 216	31, 281, 030
1864	29, 608, 736	9, 313, 279	38, 922, 015	26, 574, 624	2, 412, 523	28, 987, 147
1865	34, 776, 904	4, 044, 065	38, 820, 969	29, 541, 140	3, 012, 707	32, 553, 847
1866	48, 538, 052	6, 176, 331	54, 714, 383	24, 828, 880	4, 527, 692	29, 356, 572
1867	25, 044, 005	8, 560, 173	33, 604, 178	21, 020, 302	3, 302, 867	24, 323, 169
1868	26, 261, 379	4, 100, 842	30, 362, 221	24, 080, 777	2, 181, 495	26, 262, 272
1869	29, 293, 766	2, 796, 548	32, 090, 314	23, 381, 471	815, 761	24, 197, 232
1870	36, 265, 328	4, 824, 473	41, 089, 801	25, 339, 254	1, 510, 070	26, 849, 324
1871	34, 525, 811	2, 898, 540	37, 424, 351	32, 276, 176	2, 226, 550	34, 502, 726
1872	36, 346, 930	4, 614, 502	40, 961, 432	29, 411, 454	3, 347, 626	32, 759, 080
1873	37, 649, 532	6, 159, 538	43, 809, 070	34, 565, 113	4, 007, 446	38, 572, 556
Aggregate	575, 294, 736	77, 567, 077	652, 861, 813	678, 183, 096	42, 680, 236	720, 863, 332

The reciprocity treaty did not cover all the trade between the United States and the British provinces. The following analysis illustrates this fact:

Years.	Reciprocity imports.	Other imports.	Total.
1856	$19,383,455	$1,926,966	$21,310,421
1857	19,979,261	2,145,034	22,124,295
1858	14,752,255	1,054,264	15,806,519
1859	16,384,416	3,343,135	19,727,551
1860	20,446,586	3,404,795	23,851,381
1861	20,047,525	3,015,408	23,062,933
1862	17,152,552	2,147,443	19,299,995
1863	15,762,190	8,259,074	24,021,264
1864	27,051,130	11,870,885	38,922,015
1865	30,569,658	8,251,311	38,820,969
1866	39,582,505	15,131,878	54,714,383
Total	241,111,533	60,550,193	301,661,726

The annual imports of animals under the reciprocity ranged in value from $1,336,927 to $8,057,960; never as high as two millions until 1864, when the value was $3,165,640, and $5,503,318 in 1865, and reaching the highest figures in 1866. While the imports of living animals have never reached so high a point since, they increased from $1,902,960 in 1867 to $6,130,082 in 1870, and then declined in 1871, still more in 1872, and falling to $3,144,201 in 1873.

The imports of wheat, wheat-flour, and oats under reciprocity were as follows:

Years.	Wheat.		Wheat-flour.		Oats.		Total.
	Bushels.	*Value.*	*Barrels.*	*Value.*	*Bushels.*	*Value.*	*Value.*
1856	3,782,459	$6,239,549	435,704	$4,003,356	1,238,404	$628,946	$10,871,851
1857	3,504,260	5,051,858	1,522,411	4,131,814	2,467,433	1,494,151	10,680,823
1858	2,067,812	2,113,999	547,078	2,643,216	1,709,882	627,338	5,384,553
1859	1,242,431	1,383,363	788,893	2,340,066	3,291,026	2,440,931	6,164,360
1860	1,556,168	1,784,847	585,247	3,008,175	7,856,005	4,567,077	9,360,099
1861	4,633,464	4,823,188	1,018,826	3,055,426	4,099,380	1,701,551	9,580,165
1862	3,220,633	3,232,282	655,598	2,940,333	2,064,360	634,176	6,806,791
1863	949,095	1,050,803	460,662	2,137,610	3,501,330	1,418,723	4,607,136
1864	1,790,863	2,257,242	576,267	2,591,281	10,446,302	3,389,764	8,238,257
1865	1,304,717	1,694,910	....	2,970,348	4,792,497	2,216,722	6,881,980
1866	....	3,584,082	....	4,498,824	....	970,700	9,053,606

The figures for similar imports of grain and its products since the termination of reciprocity are as follows:

Years.	Wheat.	Wheat-flour.	Oats.	Total.
1867	$3,262,859	$1,765,285	$257,085	$5,285,229
1868	2,704,132	572,697	242,612	3,519,441
1869	1,673,620	445,003	143,190	2,261,822
1870	862,879	352,496	716,311	1,931,686
1871	874,984	143,877	242,315	1,261,176
1872	2,167,390	1,014,979	192,340	3,374,709
1873	2,021,211	433,544	72,400	2,527,155

Notwithstanding the scarcity of farm laborers during the war, the years of greatest value of these imports were 1856 and 1857; the next largest, 1861 and 1862. The average of eleven years to 1866 was $7,966,329; the average for the last seven years has been $2,880,174; a decrease due largely to the duty on these products.

Butter does not appear to any extent among reciprocity imports The annual import of cheese up to 1865, inclusive, ranged from one to four million pounds in round numbers, the smallest amount being 1,153,416 pounds in 1856, and the largest 3,930,337, but in 1866 the value of the cheese import is almost three times as much, though the quantity is not given. The average annual value of cheese import in eleven years is $551,914; the average price per pound in the ten years for which the quantity is reported is 17.2 cents. This seems quite too high, and may result from a less accurate return of quantity than of value. The range of the annual value of eggs is from $58,512 in 1856 to $187,490 in 1866, averaging $99,627.

The imports of fish and fish-products have been less since 1867 than for several years prior to that date. In 1866 fishery products had reached the value of $3,051,739; in 1873, the valuation was $1,619,421, the largest total since 1866.

The value of timber imported averaged $3,415,208 per annum under reciprocity; and for the period since the abrogation of the treaty $8,121,144, as follows:

Reciprocity period.	Value of timber.	Later period.	Value of timber.
1856	$2,832,922	1867	$6,431,060
1857	2,585,191	1868	6,727,006
1858	2,981,386	1869	7,208,536
1859	2,937,573	1870	8,670,702
1860	3,416,481	1871	8,264,837
1861	3,288,796	1872	8,410,917
1862	2,526,658	1873	11,134,956
1863	3,018,196		
1864	4,511,419		
1865	4,515,626		
1866*	5,003,040		

*In 1866 there was imported the value of $1,271,330 not under reciprocity treaty.

OCCUPATIONS OF OUR PEOPLE.

The census includes but 33 per cent. of our population in its record of persons engaged in some occupation, or 12,505,923 persons out of 28,228,945 individuals above ten years of age. The children under that age number 10,696,653, and constitute 27 per cent. of the total. While it is stated that the males above ten years number 14,258,866 and the females 13,970,079, and that of the males 10,669,635 have occupations, and only 1,836,288 of the females, it should not be inferred that the mass of our women are idlers. In agriculture the record includes 5,525,503 males and 396,968 females, but who will venture the absurdity that the five million other females in farmers' families have no occupation, or that they do no work? So in other classes a large proportion of the women find the duties of the household an occupation quite as exacting and onerous as any other. There is a small proportion of mothers and daughters mostly living in cities whose occupation appears to consist solely in the enthralling labors imposed by "society;" but fully five-sixths unenumerated as workers, between the ages of fifteen and sixty, are equally entitled with the men to be reckoned as having occupations. Multitudes between the ages of ten and twenty, of both sexes, who are engaged in the important business of educating themselves for the duties of life, have an absorbing and profitable occupation. Thus the census classification must be considered as technical, and not as furnishing a full record of the real labor of the country. The number of idlers is very small,

after deducting those infirm with age or disease, and those engaged in criminal or vicious pursuits not to be dignified with the name of occupation.

The census classification, with numbers reported, are presented in the accompanying tables, and for purposes of comparison the proportions of each, for each State and Territory, have been calculated, and are included as a valuable labor-saving feature, indispensable in investigations of such statistics. Occupations are divided into four classes—the agricultural, the professional, the exchanging, and the fabricating, the latter including miners and mechanics as well as manufacturers. The agricultural is the largest, numbering nearly six millions, and comprising 47.35 per cent. of all. Really, however, there are many included in the professional class and some in the others who are actually engaged in rural employments, enough undoubtedly to assure a clear majority of all the people as agriculturists. The most exclusively agricultural States, contrasted with those least so, present the following percentages of farmers and the value of farm-products to each person engaged in agriculture:

States.	Per cent.	Value	States.	Per cent.	Value
Mississippi	81.29	$282	Nevada	6.69	$801
Arkansas	80.41	372	Massachusetts	12.56	442
Alabama	79.84	231	Rhode Island	13.30	404
South Carolina	78.48	202	California	20.05	1,041
North Carolina	76.64	214	New Jersey	21.32	676
Georgia	75.59	230	Connecticut	22.05	606

The value of agricultural products *per capita* of those engaged in agriculture is deduced from the census record, and shows, whatever allowance should be made for unequal degrees of completeness in the official returns, or for small amounts of agricultural products grown by persons not reckoned as farmers, that the returns for farm-labor are substantially in inverse ratio to the numbers engaged in it.

The Territories have a very large proportion of the professional and personal class, the District of Columbia having 60 per cent., Arizona 51, and others high percentages. The largest proportions among the States are: Maryland, 30; Delaware, 28; New Jersey, 28; Nevada, 27; New York, 27; Michigan, 26. Arkansas, on the other hand, has 11; Alabama, 11½; Mississippi, 13; South Carolina, 13; Georgia, 14.

The influence of manufactures on the profits of agriculture may be better understood by an examination of the following figures, which show the census valuation of farm-products for each person engaged in agriculture in those States having the largest proportion engaged in other industries:

States or Territories.	Per cent. in manufactures and mining.	Value of farm products per capita of farming population.	States or Territories.	Per cent. in manufactures and mining.	Value of farm products per capita of farming population.
Idaho	66.85	$136	New Hampshire	38.74	$482
Montana	57.16	704	Pennsylvania	34.91	707
Rhode Island	53.07	404	New Jersey	34.90	676
Nevada	51.24	801	California	34.15	1,041
Massachusetts	50.47	442	New York	31.98	667
Connecticut	44.64	606	Maine	29.78	408

The average share of each farmer in the United States in the total value of farm production is $413. With the exception of Rhode Island every one of the above States exceeds this average; some more than double it. A reference to a previous table will show that the States having the least manufacturing or mining fail to reach this average, some of them yielding to farm-labor little more than half of it.

The table below will furnish food for reflection and investigation in various directions:

Number and proportion of persons engaged in the several classes of occupations in the States and Territories of the United States, as deduced from the census of 1870.

States and Territories.	Number of persons in all occupations.	Number in agricultural occupations.		Number in professional and personal occupations.	
	Number.	*Number.*	*Per cent.*	*Number.*	*Per cent.*
United States	12, 505, 923	5, 922, 471	47. 35	2, 684, 793	21. 47
Alabama	365, 258	291, 628	79. 84	42, 125	11. 54
Alaska	....	....	....	....	....
Arizona	6, 030	1, 285	21. 31	3, 115	51. 66
Arkansas	135, 949	109, 310	80.41	14, 877	10. 94
California	238, 648	47, 863	20. 05	76, 112	31. 90
Colorado	17, 583	6, 462	36. 75	3, 625	20. 62
Connecticut	193, 421	43, 653	22. 57	38, 704	20. 01
Dakota	5, 887	2, 522	42. 84	2, 704	45. 93
Delaware	40, 313	15, 973	39. 62	11, 389	28. 25
District of Columbia	49, 041	1, 365	2. 78	29, 845	60. 86
Florida	60, 703	42, 492	70	10, 897	17. 95
Georgia	444, 678	336, 145	75. 59	64, 083	14. 41
Idaho	10, 879	1, 462	13. 44	1, 423	13. 08
Illinois	742, 015	376, 441	50. 73	151, 931	20. 48
Indiana	459, 369	266, 777	58. 08	80, 018	17. 42
Indian Territory	....	....	....	....	....
Iowa	344, 276	210, 263	61. 07	58, 484	17
Kansas	123, 852	73, 228	59. 13	20, 736	16. 74
Kentucky	414, 593	261, 080	62. 97	84, 024	20. 27
Louisiana	256, 452	141, 467	55. 16	65, 347	25. 48
Maine	208, 225	82, 011	39. 39	36, 092	17. 33
Maryland	258, 543	80, 449	31. 12	79, 226	30. 64
Massachusetts	579, 844	72, 810	12. 56	131, 291	22. 64
Michigan	404, 164	187, 211	46. 32	104, 728	25. 91
Minnesota	132, 657	75, 157	56. 65	28, 330	21. 36
Mississippi	318, 850	259, 199	81. 29	40, 522	12. 71
Missouri	505, 556	263, 918	52. 20	106, 903	21. 14
Montana	14, 048	2, 111	15. 03	2, 674	19. 03
Nebraska	43, 837	23, 115	52. 73	10, 331	23. 56
Nevada	26, 911	2, 070	6. 69	7, 431	27. 61
New Hampshire	120, 168	46, 573	38. 76	18, 528	15. 42
New Jersey	296, 036	63, 128	21. 32	83, 380	28. 17
New Mexico	29, 361	18, 668	63. 58	7, 535	25. 66
New York	1, 491, 018	374, 323	25. 10	405, 339	27. 19
North Carolina	351, 299	269, 238	76. 64	51, 290	14. 60
Ohio	840, 889	397, 024	47. 21	168, 308	20. 02
Oregon	30, 651	13, 248	43. 22	6, 090	19. 88
Pennsylvania	1, 020, 544	260, 051	25. 48	283, 000	27. 73
Rhode Island	88, 574	11, 780	13. 30	19, 679	22. 22
South Carolina	263, 301	206, 654	78. 48	34, 383	13. 07
Tennessee	367, 987	267, 020	72. 56	54, 396	14. 78
Texas	237, 126	166, 753	70. 32	40, 882	17. 24
Utah	21, 517	10, 428	48. 46	5, 317	24. 71
Vermont	108, 763	57, 983	53. 31	21, 032	19. 34
Virginia	412, 665	244, 550	59. 26	98, 521	23. 87
Washington	9, 760	3, 771	38. 64	2, 207	22. 61
West Virginia	115, 229	73, 960	64. 19	16, 699	14. 49
Wisconsin	292, 808	159, 687	54. 53	58, 070	19. 83
Wyoming	6, 645	165	2. 48	3, 170	47. 71

Number, &c., of persons engaged in the several classes of occupations, &c.—Continued.

States and Territories.	Number in trade and transportation.		Number in manufactures and mechanical and mining industries.		Total population.
	Number.	*Per cent.*	*Number.*	*Per cent.*	
United States	1, 191, 238	9. 52	2, 707, 421	21. 65	38, 925, 598
Alabama	14, 435	3. 95	17, 070	4. 67	996, 992
Alaska	....	....	....	....	70, 461
Arizona	591	9. 80	1, 039	17. 23	41, 710
Arkansas	5, 491	4. 04	6, 271	4. 61	484, 471
California	33, 165	13. 90	81, 508	34. 15	582, 031
Colorado	2, 815	16. 01	4, 681	26. 62	47, 154
Connecticut	24, 720	12. 78	86, 344	44. 64	537, 454
Dakota	204	3. 47	457	7. 76	40, 501
Delaware	3, 437	8. 53	9, 514	23. 60	125, 015
District of Columbia	6, 126	12. 48	11, 705	23. 88	131, 700
Florida	3, 023	4. 98	4, 291	7. 07	188, 248
Georgia	17, 410	3. 92	27, 040	6. 08	1, 184, 109
Idaho	721	6. 63	7, 273	66. 85	20, 583
Illinois	80, 422	10. 84	133, 221	17. 95	2, 539, 891
Indiana	36, 517	7. 94	76, 057	16. 56	1, 680, 637
Indian Territory	....	....	....	....	68, 152
Iowa	28, 210	8. 19	47, 319	13. 74	1, 194, 320
Kansas	11, 762	9. 50	18, 126	14. 63	373, 299
Kentucky	25, 292	6. 10	44, 197	10. 66	1, 321, 011
Louisiana	23, 831	9. 24	25, 807	10. 07	726, 915
Maine	28, 115	13. 50	62, 007	29. 78	626, 915
Maryland	35, 542	13. 75	63, 326	24. 49	780, 894
Massachusetts	83, 078	14. 33	292, 665	50. 47	1, 457, 351
Michigan	29, 588	7. 32	82, 637	20. 45	1, 187, 234
Minnesota	10, 582	7. 98	18, 588	14. 01	446, 056
Mississippi	9, 148	2. 87	9, 981	3. 13	827, 922
Missouri	54, 885	10. 86	79, 850	15. 80	1, 721, 205
Montana	1, 233	8. 78	8, 030	57. 16	39, 895
Nebraska	4, 628	10. 56	5, 763	13. 15	122, 993
Nevada	3, 621	13. 46	13, 789	51. 24	58, 711
New Hampshire	8, 514	7. 08	16, 553	38. 74	318, 300
New Jersey	46, 206	15. 61	103, 322	34. 90	906, 096
New Mexico	863	2. 94	2, 295	7. 82	111, 303
New York	234, 581	15. 73	476, 775	31. 98	4, 387, 464
North Carolina	10, 179	2. 90	20, 592	5. 86	1, 071, 361
Ohio	78, 547	9. 34	197, 010	23. 43	2, 665, 260
Oregon	2, 619	8. 54	8, 694	28. 36	101, 883
Pennsylvania	121, 253	11. 88	356, 240	34. 91	3, 522, 050
Rhode Island	10, 108	11. 41	47, 007	53. 07	217, 353
South Carolina	8, 470	3. 22	13, 794	5. 23	707, 606
Tennessee	17, 510	4. 76	29, 061	7. 90	1, 258, 520
Texas	13, 612	5. 74	15, 879	6. 70	818, 899
Utah	1, 665	7. 74	4, 107	19. 09	99, 581
Vermont	7, 132	6. 56	22, 616	20. 79	330, 551
Virginia	20, 181	4. 89	49, 413	11. 97	1, 225, 163
Washington	1, 129	11. 57	2, 653	27. 18	37, 432
West Virginia	6, 897	5. 98	17, 673	15. 34	442, 014
Wisconsin	21, 534	7. 35	53, 517	18. 28	1, 064, 985
Wyoming	1, 646	24. 77	1, 664	25. 04	11, 518

INCREASE OF AGRICULTURAL IMPLEMENTS.

States.	Establishments.			Hands employed.			Products.		
	1870.	1860.	1850.	1870.	1860.	1850.	1870.	1860.	1850.
Alabama	3	18	2	9	84	23	$10,050	$75,636	$34,500
Arkansas	1	7	4	16	10	14	12,000	8,350	11,900
California	10	5	......	68	12	......	118,540	23,375	....
Connecticut	38	47	35	593	498	297	1,183,947	611,934	258,047
Delaware	10	17	4	56	116	20	41,325	104,181	15,175
District of Columbia	......	......	2	......	......	3	....	....	6,550
Florida	......	3	......	......	15	......	....	19,700	....
Georgia	10	17	26	59	37	205	77,450	27,300	228,837
Illinois	294	201	84	3,935	1,700	646	8,880,390	2,379,362	761,970
Indiana	124	103	58	1,268	709	210	2,128,794	865,436	146,025
Iowa	55	44	5	552	208	15	829,965	233,248	17,900
Kansas	3	1	......	29	3	......	31,252	3,670	....
Kentucky	44	65	45	624	462	217	1,384,917	619,355	184,615
Louisiana	1	13	11	15	28	29	14,000	27,300	25,610
Maine	32	46	49	219	189	325	231,991	210,404	239,78'
Maryland	34	35	76	295	368	333	549,085	340,430	257,656
Massachusetts	37	56	56	477	630	786	1,033,590	842,980	840,141
Michigan	164	108	13	969	666	35	1,569,596	684,913	30,600
Minnesota	27	12	......	167	42	......	267,841	45,150	....
Mississippi	11	34	37	34	127	113	51,800	111,813	109,260
Missouri	38	43	8	537	221	39	1,588,108	320,236	37,550
Montana	1	......	......	1	......	......	1,640	....	....
Nebraska	2	......	......	9	......	......	17,000	....	....
New Hampshire	24	20	28	184	96	147	254,470	86,414	119,096
New Jersey	30	33	24	366	260	80	633,875	310,460	72,636
New York	337	333	135	4,953	2,905	923	11,847,037	3,454,082	1,266,276
North Carolina	20	22	15	78	100	52	82,110	86,155	32,930
Ohio	219	182	161	5,124	2,239	765	11,907,366	2,820,626	557,932
Oregon	4	5	......	10	7	......	19,950	12,330	....
Pennsylvania	286	260	224	2,286	1,465	947	3,652,295	1,582,071	853,513
Rhode Island	5	3	3	81	10	70	92,464	15,845	72,000
South Carolina	......	13	13	......	30	53	....	15,375	29,939
Tennessee	25	15	53	110	110	143	132,772	117,260	97,570
Texas	12	46	......	44	138	......	42,420	100,200	....
Vermont	45	32	35	372	155	178	523,669	167,347	133,355
Virginia	37	53	98	267	418	374	403,457	420,824	213,906
West Virginia	11	......	......	55	......	......	58,281	....	....
Wisconsin	82	81	31	1,387	666	178	2,393,428	735,198	187,335
Total	2,076	1,982	1,333	25,249	14,814	7,220	52,066,875	17,487,960	6,842,611

IMMIGRATION.

The records of immigration in the Treasury Department indicate no diminution of the inflowing stream, which now adds annually to our population nearly half a million. About six-sevenths of all come from Europe, of whom nearly half are from the kingdom of Great Britain and Ireland. The movement from Germany, obstructed during the Franco-German war, has resumed its full volume. Sweden sends her usual quota, and Norway has enlarged her proportion during the past five years.

Sources.	FIRST QUARTER.			SECOND QUARTER.		
	Males.	Females.	Total.	Males.	Females.	Total.
England	6,095	2,787	8,882	18,467	10,749	29,210
Ireland	3,411	2,086	5,497	25,009	20,970	45,979
Scotland	1,006	483	1,489	3,682	1,957	5,639
Germany	9,435	5,407	14,842	34,881	26,276	61,157
Austria	157	81	238	1,377	1,260	2,637
Sweden	466	101	567	4,562	2,547	7,109
Norway	359	154	513	6,895	4,009	10,904
Denmark	181	78	259	2,363	1,119	3,482
Netherlands	330	191	521	1,548	1,079	2,627
Switzerland	389	146	535	667	416	1,083
France	1,630	1,022	2,652	1,968	1,302	3,270
Italy	1,430	356	1,786	1,840	617	2,457
Russia	81	35	116	347	222	569
Poland	380	152	532	799	466	1,265
China	2,285	232	2,517	12,105	162	12,267
Canada	2,770	1,570	4,340	4,267	2,825	7,092
Nova Scotia	264	32	296	887	573	1,460
Other countries	1,335	484	1,819	2,265	1,035	3,300
Total	32,004	15,397	47,401	123,929	77,584	201,513

Sources.	THIRD QUARTER.			FOURTH QUARTER.		
	Males.	Females.	Total.	Males.	Females.	Total.
England	11,881	8,917	20,798	5,866	4,836	10,702
Ireland	8,157	8,424	16,581	3,646	4,145	7,701
Scotland	2,213	1,694	3,907	1,112	861	1,973
Germany	17,186	12,901	30,087	15,023	12,032	27,055
Austria	884	637	1,521	1,346	1,201	2,547
Sweden	1,440	1,068	2,508	626	531	1,157
Norway	3,455	1,626	5,081	1,189	420	1,609
Denmark	364	271	635	392	327	719
Netherlands	529	405	934	336	222	558
Switzerland	417	290	707	550	348	898
France	1,264	1,064	2,328	1,479	1,081	2,560
Italy	883	282	1,165	1,568	496	2,064
Russia	1,140	651	1,791	741	273	1,014
Poland	356	252	608	271	187	458
China	2,335	122	2,457	877	35	912
Canada	4,500	2,056	6,556	2,627	1,627	4,254
Nova Scotia	616	853	1,469	641	586	1,227
Other countries	3,010	1,415	4,425	1,265	867	2,132
Total	60,630	42,928	103,558	39,565	30,075	69,640

Annual immigration into the United States from 1867 *to* 1873, *inclusive.*

Nationality.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Great Britain and Ireland	125, 520	107, 583	147, 716	151, 089	143, 937	157, 905	159, 355
Germany	133, 426	123, 070	124, 788	91, 779	107, 201	155, 595	133, 141
Austro-Hungary	692	395	2, 523	5, 284	4, 889	6, 132	7, 835
Sweden	5, 316	13, 958	24, 115	12, 009	11, 659	14, 645	11, 351
Norway	1, 739	6, 461	17, 718	12, 356	11, 307	10, 348	18, 107
Denmark	1, 436	2, 019	4, 282	3, 041	2, 346	3, 758	5, 095
Netherlands	2, 223	652	1, 360	970	1, 122	2, 006	4, 640
Belgium	789	1, 578	1, 003	1, 039	168	964	1, 306
Switzerland	4, 168	3, 261	3, 488	2, 474	2, 824	4, 031	3, 223
France	5, 237	3, 936	4, 118	3, 586	5, 780	13, 782	10, 813
Spain	904	816	1, 112	511	618	558	486
Portugal	126	245	265	291	59	370	34
Italy, including Sicily, Sardinia, and Malta	1, 624	1, 408	2, 182	2, 940	2, 948	7, 322	7, 511
Greece	10	8	17	15	10	18	37
Turkey	26	13	10	13	21	34	78
Russia	205	204	580	766	1, 005	1, 311	3, 490
Poland	310	248	67	424	832	2, 606	2, 863
Finland	....	....	....	....	24	71	113
Heligoland	....	....	....	....	2	1	1
Gibraltar	....	....	....	1	4	3	8
Corsica	....	....	....	3	....	....	....
Europe, (not specified)	....	....	....	1	....	....	....
Atlantic Islands	391	310	452	574	920	1, 168	1, 478
West India Islands	817	858	3, 016	1, 109	1, 228	1, 309	1, 974
North America	6, 310	11, 172	31, 300	53, 826	40, 432	40, 903	30, 015
South America	224	145	59	84	110	123	168
Asia	3, 961	10, 701	15, 000	12, 058	6, 070	10, 681	18, 219
Africa	25	63	31	24	25	40	13
Australia, Pacific and East India Islands	1	1	44	25	1, 289	1, 920	1, 053
Born at sea	1	3	....	10	77	133	138
Not specified, (exclusive of Europe)	11, 891	23, 292	49, 923	67, 711	50, 182	56, 290	....
Countries not stated	2, 877	8, 107	10, 656	22, 494	20, 882	11, 752	....
Total aliens	298, 358	297, 215	395, 922	378, 796	367, 789	449, 483	422, 545
Less those not intending to remain in the United States	4, 757	8, 070	10, 635	22, 493	20, 851	11, 733	....
Net immigration	293, 601	289, 145	385, 287	356, 303	346, 938	437, 750	422, 545
Total for Europe	283, 751	265, 855	335, 364	288, 592	296, 756	361, 460	369, 487

DAIRY PRODUCTS.

The following tables show the number of milch-cows, together with the annual production of butter and cheese, as shown by the last three census reports. It should be observed that the number of cows reported is far below the actual number, taking no account of cows kept in towns and cities. The increase from 1850 to 1860 was 34 per cent., while from 1860 to 1870 it was but 4 per cent. The production of butter increased during the first decade nearly 46 per cent., and less than 12 per cent. during the second. Dairy-cheese production declined nearly 2 per cent. in the first decade, and 48 per cent. in the second, but if we add to the dairy product the factory cheese, the last decade shows an increase of nearly 60 per cent.

The cheese-factory system is of very recent origin. The census report of 1860 shows but two such establishments, both in Litchfield County, Connecticut, which, with a capital of $8,000, consumed raw materials to the value of $9,441, and paid for labor, to four male and three female employés, only $984; the total value of the product was $13,400. In 1870 there were 1,133 establishments; capital invested, $3,690,075; materials used, $14,089,284; cost of labor, $706,566; cheese produced, 109,435,229 pounds, which, with other products, valued at $61,096, made a grand total valuation of $16,771,665.

The production of cheese has been greatly enlarged since the last cen-

us by the extension of the factory system, as is shown by our increasing export to foreign countries. During 1870 we exported 60,113,090 pounds, valued at $8,646,491; during 1871, 69,907,167 pounds, valued at $8,027,754; during 1872, 65,459,462 pounds, valued at $8,421,114; during 1873, 91,358,077 pounds, valued at $11,911,541. Our exports of butter during the same four years were as follows: 1870, 2,079,751 pounds, valued at $570,432; 1871, 8,568,012 pounds, valued at $1,606,239; 1872, 5,044,227 pounds, valued at $1,041,032; 1873, 4,074,657 pounds, valued at $947,986.

Professor Willard estimates the average annual yield of milk per head at 1,800 quarts of an average value of 2½ cents per quart. At this rate our cows in 1873 produced 19,269,540,000 quarts, worth $449,622,600. Mr. Willard at the annual meeting of the Vermont Dairymen's Association, in October, 1873, made the following approximate estimate of the quantity and value of our dairy products for that year:

Milk consumed as food, at 2⅓ cents per quart	$213,000,000
Condensed milk	1,000,000
Butter, 700,000,000 pounds, at 25 cents per pound	175,000,000
Cheese, 240,000,000 pounds, at 12 cents per pound	28,800,000
Whey, sour milk, &c., converted into pork	10,000,000
Total	427,800,000

The total amount approximated $430,000,000; in 1874 it will probably reach half a billion dollars. Nearly the whole bulk of this enormous production is consumed at home. Only low grades of butter are sent abroad. Our total export of butter, cheese, and condensed milk in 1873 amounted to $12,939,320.

Milch-cows and butter products.

States and Territories.	1870.		1860.		1850.	
	Milch-cows.	Butter.	Milch-cows.	Butter.	Milch-cows.	Butter.
	Number.	*Pounds.*	*Number.*	*Pounds.*	*Number.*	*Pounds.*
The United States........	8, 935, 332	514, 092, 683	8, 585, 735	459, 681, 372	6, 385, 094	313, 345, 306
Alabama..................	170, 640	3, 213, 753	230, 537	6, 028, 478	227, 791	4, 008, 811
Arizona..................	938	800	....	....	....	....
Arkansas..................	128, 959	2, 753, 931	171, 003	4, 067, 556	93, 151	1, 854, 239
California................	164, 093	7, 969, 744	205, 407	3, 095, 035	4, 280	705
Colorado..................	25, 017	392, 920	....	....	....	....
Connecticut...............	98, 889	6, 716, 007	98, 877	7, 620, 912	85, 461	6, 498, 119
Dakota....................	4, 151	209, 735	286	2, 170	....	....
Delaware..................	24, 082	1, 171, 963	22, 595	1, 430, 502	19, 248	1, 055, 308
District of Columbia......	657	4, 495	639	18, 835	813	14, 872
Florida...................	61, 922	100, 989	92, 974	408, 855	72, 876	371, 498
Georgia...................	231, 310	4, 499, 572	299, 688	5, 439, 765	334, 223	4, 640, 559
Idaho.....................	4, 171	111, 480	....	....	....	....
Illinois..................	640, 321	36, 083, 405	522, 634	28, 052, 551	294, 671	12, 526, 543
Indiana...................	393, 736	22, 915, 385	363, 553	18, 306, 651	284, 554	12, 881, 535
Iowa......................	369, 811	27, 512, 179	189, 802	11, 953, 666	45, 704	2, 171, 188
Kansas....................	123, 440	5, 022, 758	28, 550	1, 093, 497	....	....
Kentucky..................	247, 615	11, 874, 978	269, 215	11, 716, 609	247, 475	9, 947, 523
Louisiana.................	102, 076	322, 405	129, 662	1, 444, 742	105, 576	683, 069
Maine.....................	139, 259	11, 636, 482	147, 314	11, 687, 781	133, 556	9, 243, 811
Maryland..................	94, 794	5, 014, 729	99, 463	5, 265, 295	86, 856	3, 806, 160
Massachusetts.............	114, 771	6, 559, 161	144, 492	8, 297, 936	130, 099	8, 071, 370
Michigan..................	250, 859	24, 400, 185	179, 543	15, 503, 482	99, 676	7, 065, 878
Minnesota.................	121, 467	9, 522, 010	40, 344	2, 957, 673	607	1, 100
Mississippi...............	173, 899	2, 613, 521	207, 646	5, 006, 610	214, 231	4, 346, 234
Missouri..................	398, 515	14, 455, 825	345, 243	12, 704, 837	230, 169	7, 834, 359
Montana...................	12, 432	408, 080	....	....	....	....
Nebraska..................	28, 940	1, 539, 535	6, 995	342, 541	....	....
Nevada....................	6, 174	110, 880	947	7, 700	....	....
New Hampshire.............	90, 583	5, 965, 080	94, 880	6, 956, 764	94, 277	6, 977, 056
New Jersey................	133, 331	8, 266, 023	138, 818	10, 714, 447	118, 736	9, 487, 210
New Mexico................	16, 417	12, 912	34, 369	13, 259	10, 635	111
New York..................	1, 350, 661	107, 147, 526	1, 123, 634	103, 097, 280	931, 324	79, 766, 094
North Carolina............	196, 731	4, 297, 834	228, 623	4, 735, 495	221, 799	4, 146, 290
Ohio......................	654, 390	50, 266, 372	676, 585	48, 543, 162	544, 499	34, 449, 379
Oregon....................	48, 325	1, 418, 373	53, 170	1, 000, 157	9, 427	211, 464
Pennsylvania..............	706, 437	60, 834, 644	673, 547	58, 653, 511	530, 224	39, 878, 418
Rhode Island..............	18, 806	941, 199	19, 700	1, 021, 767	18, 698	995, 670
South Carolina............	98, 693	1, 461, 980	163, 938	3, 177, 934	193, 244	2, 981, 850
Tennessee.................	243, 197	9, 571, 069	249, 514	10, 017, 787	250, 456	8, 139, 585
Texas.....................	428, 048	3, 712, 747	601, 540	5, 850, 583	217, 811	2, 344, 900
Utah......................	17, 563	310, 335	11, 967	316, 046	4, 861	83, 309
Vermont...................	180, 285	17, 844, 396	174, 667	15, 900, 359	146, 128	12, 137, 980
Virginia..................	188, 471	6, 979, 269	330, 713	13, 464, 722	317, 619	11, 089, 359
Washington................	16, 938	407, 306	9, 660	153, 092	....	....
West Virginia.............	104, 434	5, 044, 475	....	....	....	....
Wisconsin.................	308, 377	22, 473, 036	203, 001	13, 611, 328	64, 339	3, 633, 750
Wyoming...................	707	1, 200	....	....	....	....

Census returns of dairy-cheese production.

States and Territories.	1870.	1860.	1850.
	Pounds.	*Pounds.*	*Pounds.*
United States	53, 492, 153	103, 663, 927	105, 535, 893
Alabama	2, 372	15, 923	31, 412
Arizona	14, 500	....	....
Arkansas	2, 119	16, 810	30, 088
California	3, 395, 074	1, 343, 689	150
Colorado	33, 626	....	....
Connecticut	2, 031, 194	3, 898, 411	5, 363, 277
Dakota	1, 850	....	....
Delaware	315	6, 579	3, 187
Dist. Columbia	....	....	1, 500
Florida	25	5, 280	18, 015
Georgia	4, 292	15, 587	46, 976
Idaho	4, 464	....	....
Illinois	1, 661, 703	1, 848, 557	1, 278, 225
Indiana	283, 807	605, 795	624, 564
Iowa	1, 087, 741	918, 635	209, 840
Kansas	226, 607	29, 045	....
Kentucky	115, 219	190, 400	213, 954
Louisiana	11, 747	6, 153	1, 957
Maine	1, 152, 590	1, 799, 862	2, 434, 454
Maryland	6, 732	8, 342	3, 975
Massachusetts	2, 245, 873	5, 294, 090	7, 088, 142
Michigan	670, 804	1, 641, 897	1, 011, 492
Minnesota	233, 977	199, 314	....
Mississippi	3, 099	4, 427	21, 191
Missouri	204, 090	259, 633	203, 572
Montana	25, 603	....	....
Nebraska	46, 142	12, 342	....
Nevada	....	....	....
N. Hampshire	849, 818	2, 232, 092	3, 196, 563
New Jersey	38, 229	182, 172	365, 756
New Mexico	27, 239	37, 240	5, 848
New York	22, 769, 964	48, 548, 289	49, 741, 413
North Carolina	75, 185	51, 119	95, 921
Ohio	8, 169, 486	21, 618, 893	20, 819, 542
Oregon	79, 333	105, 379	36, 980
Pennsylvania	1, 145, 209	2, 508, 556	2, 505, 034
Rhode Island	81, 976	181, 511	316, 508
South Carolina	169	1, 543	4, 970
Tennessee	142, 240	135, 575	177, 681
Texas	34, 342	275, 128	95, 299
Utah	69, 603	53, 331	30, 998
Vermont	4, 830, 700	8, 215, 030	8, 720, 834
Virginia	71, 743	280, 852	436, 292
West Virginia	32, 429		
Washington	17, 465	12, 146	....
Wisconsin	1, 591, 798	1, 104, 300	400, 283
Wyoming	....	....	....

Factory-cheese, 1870.

States and Territories.	Number of establishments.	Capital.	Wages.	All materials.	Cheese products.	Other products.	All products.
		Dollars.	*Dollars.*	*Dollars.*	*Pounds.*	*Dollars.*	*Dollars.*
United States	1, 313	3, 690, 075	706, 566	14, 089, 284	109, 435, 229	61, 096	16, 771, 665
Colorado	1	1, 800	....	480	4, 000	....	1, 280
Connecticut	7	9, 600	1, 140	27, 400	231, 700	....	38, 024
Illinois	69	191, 400	32, 721	440, 890	4, 072, 301	1, 000	557, 356
Indiana	17	26, 270	1, 550	11, 686	107, 680	....	16, 076
Iowa	14	25, 415	3, 700	25, 579	256, 906	....	44, 590
Kansas	1	1, 200	300	1, 500	15, 000	....	2, 700
Kentucky	4	31, 600	6, 700	27, 685	246, 000	....	42, 000
Massachusetts	23	85, 330	15, 399	281, 768	1, 885, 486	....	321, 900
Michigan	30	122, 750	13, 320	186, 989	1, 650, 997	70	239, 659
Minnesota	2	6, 300	475	4, 525	37, 500	....	5, 850
Missouri	1	300	....	828	9, 785	....	1, 946
Montana	1	3, 200	350	328	2, 000	....	800
Nebraska	5	5, 650	350	4, 040	32, 400	1, 950	7, 270
New Hampshire	2	3, 000	370	3, 690	23, 250	....	4, 650
New Jersey	8	9, 200	4, 756	43, 643	440, 107	2, 875	52, 147
New York	818	2, 329, 400	450, 889	10, 372, 598	78, 006, 048	20, 471	12, 164, 065
North Carolina	3	14, 500	2, 420	6, 474	48, 800	....	9, 700
Ohio	195	474, 970	116, 635	1, 875, 711	15, 984, 390	450	2, 287, 804
Oregon	1	800	480	5, 959	40, 000	....	8, 400
Pennsylvania	27	109, 750	19, 074	205, 367	1, 647, 467	38, 780	268, 702
Vermont	28	107, 700	18, 305	365, 928	2, 984, 179	....	445, 323
Virginia	2	3, 200	650	1, 500	12, 500	....	2, 310
Wisconsin	54	126, 740	16, 982	194, 716	1, 696, 783	500	240, 056

STATEMENT OF THE AGRICULTURAL EXPORTS OF THE UNITED STATES, WITH THEIR IMMEDIATE MANUFACTURES, FOR THE FIVE FISCAL YEARS ENDING JUNE 30, 1873.

Articles.	1869.		1870.		1871.		1872.		1873.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Animals, living:										
Hogs .... number.			12, 058	$189, 753	8, 770	$61, 390	56, 110	$548, 153	99, 720	$787, 402
Horned cattle .... do.			27, 530	439, 987	20, 530	403, 491	28, 033	565, 719	35, 455	695, 957
Horses .... do.	....	$917, 046	2, 121	177, 479	1, 186	173, 273	1, 722	268, 475	2, 814	255, 365
Mules .... do.			995	140, 350	1, 930	265, 827	2, 121	294, 402	1, 659	172, 172
Sheep .... do.			39, 570	95, 193	45, 465	86, 888	35, 218	79, 592	66, 717	107, 698
All other, and fowls			....	2, 277	....	28, 735	....	17, 375	....	14, 853
Animal matter:										
Bone-black, ivory-black, &c .... pounds.	....	....	679, 134	32, 487	586, 236	25, 980	2, 650, 142	46, 147	1, 392, 150	39, 307
Bones and bone-dust .... cwt.	....	....	45, 928	75, 583	35, 572	55, 629	61, 809	106, 567	100, 185	167, 135
Candles .... pounds.	2, 535, 060	432, 793	2, 277, 955	374, 565	2, 321, 959	348, 368	2, 299, 840	341, 210	1, 998, 557	301, 202
Furs and fur-skins	....	2, 039, 563	....	1, 941, 139	....	1, 590, 193	....	3, 343, 005	....	3, 725, 550
Glue	....	....	22, 354	5, 621	81, 110	12, 316	85, 717	17, 988	45, 559	8, 754
Hair, unmanufactured	....	....	....	205, 143	....	301, 095	....	348, 364	....	334, 663
manufactures of	....	....	....	4, 863	....	31, 679	....	25, 803	....	48, 795
Hats, caps, and bonnets of fur, silk, or wool.	....	....	....	149, 216	....	169, 921	....	188, 574	....	158, 344
Hides and skins other than fur	....	292, 491	....	365, 212	....	700, 604	....	1, 445, 178	....	3, 605, 023
Leather and its manufactures:										
of all kinds not specified .... pounds.	....	295, 933	373, 224	106, 312	1, 900, 044	480, 543	12, 102, 019	2, 864, 800	17, 241, 746	4, 365, 174
Morocco and other fine	....	....	....	4, 765	....	18, 690	....	153, 962	....	247, 711
Boots and shoes .... pairs.	303, 884	475, 607	276, 179	419, 612	301, 216	445, 460	325, 296	502, 689	260, 759	421, 548
Saddlery and harness	....	67, 064	....	55, 379	....	798, 182	....	65, 599	....	101, 943
Other manufactures	....	....	....	87, 263	....	154, 514	....	96, 979	....	169, 118
Oil, lard .... gallons.	....	....	90, 774	124, 860	147, 802	153, 850	533, 147	432, 483	388, 836	298, 731
Neats-foot .... do.	....	....	501	649	80	137	26, 393	9, 402	10, 984	9, 237
Provisions:										
Bacon and hams .... pounds.	49, 228, 165	7, 482, 060	38, 968, 256	6, 123, 113	71, 446, 854	8, 126, 683	246, 208, 143	21, 126, 592	395, 381, 737	35, 022, 137
Beef .... do.	27, 299, 107	2, 430, 357	26, 727, 773	1, 939, 778	43, 880, 217	3, 825, 666	26, 652, 094	1, 870, 826	31, 605, 196	2, 447, 481
Butter .... do.	1, 324, 332	484, 094	2, 019, 288	592, 229	3, 965, 043	853, 096	7, 746, 261	1, 498, 812	4, 518, 844	952, 919
Cheese .... do.	39, 960, 367	6, 437, 866	57, 296, 327	8, 881, 934	63, 698, 867	8, 752, 990	66, 204, 025	7, 752, 918	80, 366, 540	10, 498, 010
Condensed milk	....	....	....	140, 099	....	91, 624	....	86, 808	....	94, 385
Eggs .... dozen.	....	....	814	322	5, 017	1, 428	5, 148	1, 048	15, 683	4, 169
Lard .... pounds.	41, 887, 545	7, 443, 948	35, 808, 530	5, 933, 397	80, 037, 297	10, 563, 020	199, 651, 660	20, 177, 619	230, 534, 207	21, 245, 815
Pork .... do.	24, 439, 832	3, 422, 928	24, 639, 831	3, 253, 137	39, 250, 750	4, 302, 320	57, 169, 518	4, 122, 308	64, 147, 461	5, 007, 035
Preserved meats	....	....	....	313, 757	....	208, 362	....	697, 067	....	575, 407
Soaps, perfumed and toilet	....	....	....	4, 637	....	16, 954	....	9, 436	....	10, 561
All other .... pounds.	5, 792, 683	511, 984	7, 729, 283	622, 715	7, 786, 276	576, 026	8, 676, 736	606, 527	9, 441, 891	657, 297
Tallow .... do.	20, 534, 628	2, 362, 630	37, 513, 056	3, 814, 861	33, 859, 317	3, 025, 035	76, 151, 218	6, 973, 189	79, 170, 558	7, 068, 471
Wax .... do.	....	....	346, 668	137, 443	365, 195	113, 070	446, 474	126, 130	374, 486	118, 053

Wool, raw and fleece ....do....	444,387	152,443	152,892	54,928	25,195	8,762	140,515	36,434	75,129	17,624
manufactures of	....	163,438	....	124,159	....	238,405	....	212,669	....	209,897
Total value of animal matter..................	....	35,412,245	....	36,934,217	....	47,010,312	....	77,060,849	....	99,964,943
Breadstuffs and their preparations:										
Barley ....bushels.	59,077	$46,920	255,400	$140,512	340,093	$200,625	86,891	$63,407	483,410	$323,187
Bread and biscuit..........................pounds.	9,094,065	623,506	10,158,510	581,046	13,801,624	760,637	10,548,879	629,841	11,700,767	690,832
Corn ....bushels.	7,047,197	6,820,719	1,392,115	1,287,575	9,826,309	7,458,997	39,401,650	23,984,365	38,541,930	23,794,694
Corn-meal ....barrels.	309,867	1,656,273	187,093	935,676	212,641	951,830	308,840	1,214,999	403,111	1,474,827
Oats...bushels.	481,871	306,678	121,517	76,528	147,572	83,080	262,975	135,129	714,072	290,575
Rye ....do....	49,501	55,957	157,606	178,275	49,674	44,678	794,967	703,929	562,021	469,547
Rye flour ....barrels.	7,228	52,249	6,974	38,458	6,250	34,135	6,287	34,401	8,288	46,129
Wheat ....bushels.	17,557,836	24,383,259	36,584,115	47,171,229	34,304,906	45,143,424	26,423,080	38,915,060	39,204,285	51,452,254
Wheat flour ....barrels.	2,431,873	18,813,865	3,463,333	21,169,593	3,653,841	24,093,184	2,514,535	17,955,684	2,562,086	19,381,664
Other small grains and pulse..................	....	....	....	384,198	....	357,893	....	479,449	....	394,890
Other preparations of breadstuffs for food .	....	169,088	....	287,843	....	252,704	....	470,009	....	424,552
Rice...pounds.	2,232,833	145,934	2,133,014	127,655	445,842	22,502	403,835	28,768	276,637	19,740
Starch...do....	1,865,078	162,026	1,301,962	107,187	1,761,873	115,698	3,331,763	165,415	6,133,323	327,940
Total value of breadstuffs, &c..................	....	53,256,474	....	72,485,775	....	79,519,387	....	84,780,456	....	99,090,831
Cotton and its manufactures:										
Sea island ....pounds.	2,785,244	2,374,892	5,409,780	2,906,433	3,312,988	1,437,539	2,709,106	1,410,303	5,693,909	2,350,687
Other manufactured ....do....	641,542,677	160,258,160	953,148,743	224,121,191	1,459,715,036	216,889,570	930,828,307	179,274,292	1,194,359,621	224,892,382
Manufactures	....	5,874,222	....	....	....	....	....	....	....	....
Colored goods.................................yards.	....	....	6,064,715	1,035,469	5,083,923	724,841	2,844,888	458,998	3,585,629	596,912
Uncolored goods..............................do....	....	....	8,276,384	1,345,988	14,832,931	1,776,694	8,859,191	1,317,719	10,187,145	1,655,116
All other..	....	....	....	1,405,825	....	1,056,601	....	527,613	....	695,500
Total value of cotton, &c..........................	....	168,507,274	....	230,814,906	....	221,885,245	....	182,988,925	....	230,190,597
Wood and its products:										
Boards, planks, joists, &c ....M feet.	134,370	2,817,906	140,863	2,920,429	154,830	2,764,329	176,872	3,466,431	236,557	4,625,863
Laths, palings, pickets, &c ....M.	5,886	24,637	8,044	38,296	2,326	6,896	2,723	9,356	2,614	40,345
Shingles ....M	27,342	121,809	28,787	113,431	23,254	99,268	27,042	127,338	33,441	137,359
Box shooks	....	558,508	....	374,246	....	138,813	....	113,448	....	263,277
Other shooks, staves, and headings	....	5,782,414	....	4,897,733	....	4,822,705	....	5,003,551	....	6,091,771
Hogsheads and barrels, empty ....number.	....	....	162,177	277,284	152,230	292,561	159,506	277,307	145,277	267,195
All other lumber..................................	....	1,058,221	....	369,010	....	242,474	....	427,240	....	249,872
Firewood..cords.	9,836	23,347	8,341	20,725	8,090	19,892	5,428	14,097	6,324	18,360
Hop, hoop, and telegraph poles...............	....	341,087	....	529,427	....	731,239	....	534,714	....	672,893
Logs, masts, and other whole timber.........	....	322,310	....	535,522	....	244,682	....	362,527	....	707,079
Timber, sawn or hewn ....cubic feet.	3,853,000	846,772	7,115,975	1,219,074	7,115,007	1,309,094	12,594,738	2,107,676	14,154,244	2,731,635
All other timber	....	316,311	....	103,230	....	136,403	....	99,304	....	153,802
Household furniture	....	1,202,486	....	1,245,886	....	1,110,091	....	1,493,679	....	1,727,764
Wooden-ware......................................	....	287,852	....	258,347	....	216,908	....	196,606	....	237,097
Other manufactures...............................	....	1,422,799	....	832,198	....	781,187	....	1,007,598	....	1,224,584
Ashes, pot and pearl.........................pounds.	2,998,847	249,339	2,316,877	168,731	1,474,954	103,249	1,413,901	108,474	1,007,753	88,562
Bark for tanning..................................	....	....	....	210,488	....	96,195	....	166,501	....	168,939
Rosin and turpentine.......................barrels.	585,989	2,020,519	583,316	1,776,625	511,959	1,600,651	692,728	3,256,854	845,162	3,631,906
Spirits of turpentine.......................gallons.	3,184,955	1,444,968	3,246,697	1,357,302	2,453,554	1,009,508	4,405,441	2,521,357	5,114,653	2,667,380

Statement of the agricultural exports of the United States, &c.—Continued.

Articles.	1869.		1870.		1871.		1872.		1873.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Wood and its products—Continued.										
Tar and pitch......barrels.	52, 241	$195, 025	47, 401	$143, 460	32, 584	$93, 884	36, 722	$131, 010	43, 535	$177, 435
Total value of wood, &c......	....	19, 036, 310	....	17, 397, 444	....	15, 820, 029	....	21, 425, 068	....	25, 854, 120
Miscellaneous:										
Brooms, brushes, &c......	....	129, 455	....	154, 419	....	215, 131	....	166, 338	....	186, 810
Cordage, ropes, &c......pounds.	2, 335, 536	424, 795	1, 222, 314	251, 343	2, 130, 517	381, 779	2, 116, 029	362, 343	2, 625, 529	417, 044
Fruits of all kinds......	....	306, 142	....	....	....	....	....	....	....	....
apples, green, ripe, or dried......	....	....	....	309, 400	....	215, 719	....	389, 508	....	1, 091, 692
other, green, ripe, or dried......	....	....	....	151, 367	....	138, 355	....	164, 541	....	292, 935
preserved in cans, &c......	....	....	....	81, 735	....	195, 283	....	250, 420	....	318, 678
Ginseng......pounds.	....	....	474, 310	455, 097	114, 221	119, 385	401, 260	341, 616	350, 141	341, 144
Hats, caps, &c., of vegetable fabric......	....	....	....	45, 289	....	54, 392	....	32, 844	....	86, 855
Hay......tons.	....	....	6, 723	117, 137	4, 581	104, 261	5, 266	135, 714	4, 557	110, 880
Hemp, unmanufactured......cwt.	....	....	4, 240	45, 260	573	5, 775	561	7, 103	978	9, 121
cordage, cables, &c......do..	....	....	14, 326	218, 496	10, 207	190, 946	9, 918	195, 901	14, 960	275, 100
other manufactures......	....	....	....	67, 035	....	85, 066	....	114, 869	....	170, 725
Hops......pounds.	11, 269, 555	1, 627, 248	16, 356, 231	2, 515, 734	3, 273, 653	316, 288	3, 061, 244	408, 305	1, 795, 437	272, 403
Liquors, alcoholic:										
Beer, ale, porter, cider, in bottles.doz.	....	....	1, 076	2, 250	1, 570	4, 077	2, 205	5, 340	3, 443	7, 712
in casks......gallons.	....	....	66, 467	23, 759	105, 213	34, 301	77, 639	27, 829	103, 009	36, 743
Spirits, distilled from grain......do....	47, 008	86, 908	23, 268	47, 218	47, 660	68, 601	26, 606	45, 278	654, 365	359, 646
from molasses......do....	1, 065, 011	638, 495	872, 904	653, 085	726, 975	376, 057	882, 464	517, 556	1, 013, 062	469, 622
from other materials......do....	61, 207	76, 690	19, 457	25, 118	5, 518	6, 988	41, 143	28, 665	35, 656	23, 371
Wine......do....	....	....	32, 812	42, 120	19, 217	26, 444	31, 263	37, 713	46, 715	48, 202
Oil-cake......pounds.	166, 877, 330	4, 493, 196	156, 156, 059	3, 419, 288	203, 587, 040	4, 160, 021	206, 979, 910	3, 966, 368	194, 318, 946	3, 611, 562
Oil, vegetable, cotton-seed......gallons.	....	....	....	....	....	....	547, 165	293, 546	709, 576	370, 506
linseed......do....	....	....	21, 804	22, 913	37, 841	35, 962	28, 375	26, 914	47, 453	46, 087
castor......do....	....	....	289	777	700	1, 254	....	....	....	....
essential or volatile......do....	....	....	....	288, 450	....	119, 311	....	235, 556	....	128, 233
Seeds, cotton......pounds.	....	....	....	....	....	....	6, 360, 109	72, 212	4, 005, 009	45, 486
flax or lint......bushels.	....	....	85	120	282	721	600	1, 867	490	1, 345
all others......	....	....	....	98, 358	....	2, 336, 252	....	3, 765, 025	....	1, 114, 231
Sugar, brown......pounds.	16, 357	2, 111	12, 476	1, 403	43, 800	2, 453	17, 065	2, 170	212 625	19, 647
refined......do...	3, 151, 166	472, 311	4, 415, 100	555, 482	3, 797, 278	500, 986	4, 461, 427	561, 455	9, 870, 738	1, 142, 824
molasses......gallons.	268, 995	133, 439	299, 672	89, 912	2, 794, 829	693, 806	2, 726, 858	603, 120	3, 055, 836	611, 084
candy and confectionery......pounds.	20, 470	5, 583	....	14, 729	....	20, 969	....	22, 488	....	27, 873
Tobacco, leaf......do...	181, 527, 630	20, 552, 943	185, 748, 881	21, 100, 420	215, 667, 604	19, 908, 797	234, 896, 892	24, 136, 166	213, 995, 176	22, 689, 135
cigars......M.	439	15, 519	365	9, 584	1, 433	53, 043,	197	6, 648	215	7, 764
snuff......pounds.	31, 497	20, 252	20, 181	12, 226	18, 724	11, 683	15, 092	5, 241	12, 196	7, 462

other manufactures	....	2,759,005	....	1,582,995	....	2,022,434	....	2,511,866	....	2,627,585
Vegetables and their preparations:										
Onions .... bushels.	....	....	59,099	98,909	56,953	79,114	80,619	78,988	41,881	53,616
Pickles and sauces	....	....	....	15,775	....	15,857	....	20,876	....	11,697
Potatoes .... bushels.	508,249	451,435	596,968	412,488	553,070	432,815	621,537	482,648	515,306	498,291
All other	....	220,578	....	90,004	....	124,760	....	105,813	....	122,456
Vinegar .... gallons.	....	....	61,224	13,774	35,244	9,095	28,435	8,356	19,481	5,097
Total	....	32,416,105	....	33,033,469	....	33,069,081	....	40,139,296	....	37,660,376

Recapitulation.

Animal matter	....	35,412,245	....	36,934,217	....	47,010,312	....	77,060,849	....	99,964,943
Breadstuffs, &c	....	53,256,474	....	72,485,775	....	79,519,387	....	85,155,523	....	99,090,831
Cotton, &c	....	168,507,274	....	230,814,906	....	221,885,245	....	182,988,925	....	230,190,597
Wood, &c	....	19,036,310	....	17,397,444	....	15,820,029	....	21,425,068	....	25,854,120
Miscellaneous	....	32,416,105	....	33,033,469	....	33,069,081	....	40,139,296	....	37,660,376
Total	....	308,628,408	....	390,663,811	....	397,304,054	....	406,769,661	....	492,700,867

Recapitulation of exports of the growth and products of the United States for forty-five years, from 1826 to 1870 inclusive, in periods of five years each, with the annual average for each period.

Articles.	Five years ending 1830.	Five years ending 1835.	Five years ending 1840.	Five years ending 1845.	Five years ending 1850.	Five years ending 1855.	Five years ending 1860.	Five years ending 1865.	Five years ending 1870.
Animals and their products	$23, 011, 879	$24, 365, 223	$20, 309, 261	$33, 896, 486	$63, 473, 863	$67, 898, 685	$104, 220, 935	$256, 559, 258	$177, 173, 771
Breadstuffs, &c	42, 363, 119	48, 095, 362	47, 114, 914	51, 705, 513	142, 232, 388	134, 181, 567	203, 046, 397	364, 104, 797	276, 313, 287
Cotton, &c	139, 007, 584	217, 448, 062	336, 561, 729	273, 390, 047	319, 576, 828	526, 235, 464	782, 571, 357	85, 089, 800	1, 046, 251, 050
Wood, &c	15, 632, 507	17, 403, 004	20, 043, 813	19, 331, 158	20, 383, 180	30, 248, 638	61, 354, 408	55, 346, 795	82, 020, 777
Miscellaneous	32, 841, 875	37, 848, 758	52, 412, 149	52, 147, 603	48, 999, 940	77, 192, 944	132, 658, 234	170, 855, 935	174, 602, 053
Aggregate	252, 856, 964	345, 160, 409	476, 441, 876	430, 470, 807	594, 666, 199	835, 757, 298	1, 283, 851, 331	931, 956, 585	1, 714, 360, 938

Annual average for each period of five years.

Articles.	Five years ending 1830.	Five years ending 1835.	Five years ending 1840.	Five years ending 1845.	Five years ending 1850.	Five years ending 1855.	Five years ending 1860.	Five years ending 1865.	Five years ending 1870.
Animals and their products	$4, 602, 375	$4, 873, 044	$4, 061, 852	$6, 779, 297	$12, 694, 772	$13, 579, 737	$20, 844, 187	$51, 311, 851	$35, 434, 754
Breadstuffs	8, 472, 623	9, 619, 072	9, 422, 982	10, 341, 102	28, 446, 477	26, 836, 313	40, 609, 279	72, 820, 959	55, 262, 657
Cotton, &c	27, 801, 516	43, 489, 612	67, 312, 345	54, 678, 009	63, 915, 365	105, 247, 092	156, 514, 271	17, 017, 960	209, 250, 210
Wood, &c	3, 126, 501	3, 490, 600	4, 008, 762	3, 866, 231	4, 076, 636	6, 049, 727	12, 270, 881	11, 069, 359	16, 405, 155
Miscellaneous	6, 568, 375	7, 569, 751	10, 482, 429	10, 429, 520	9, 799, 988	15, 438, 568	26, 531, 647	34, 171, 187	34, 920, 511
[illegible]rage annual aggregate	50, 571, 390	69, 042, 079	95, 288, 370	86, 094, 159	118, 933, 238	167, 151, 457	250, 770, 265	186, 391, 316	351, 273, 287

FLOUR AND GRAIN MOVEMENTS.

The commercial records of the grain movement are not sufficiently complete to render possible a perfect statement. The scope of inquiry is too narrow and local, and the methods employed too superficial. The collection of facts has been left too exclusively in the hands of the journalist, who is satisfied with merely chronicling the daily aspects of the market, and by whom the preparation of a comprehensive and thoughtful *résumé* is frequently regarded as a work of supererogation, if not of positive disgust. A great improvement is noticeable in the better class of commercial journals, some of which have published annual statements of permanent value as records. The annual reports of boards of trade and chambers of commerce have enlarged their scope of inquiry, and now present compilations of facts prepared by experts, whose labors command increasing respect. Yet the lack of concert of action destroys in a great measure the value of those compilations. For instance, some reports refer to calendar years, others to commercial years, and still others to harvest years. If the National Board of Trade would secure a uniform system of commercial reports in all our leading commercial cities, it would relieve the statistician from his most formidable difficulties and render practicable a close approximation to the real movements of our domestic commerce. It is remarkable that in the western cities, where commercial journalism is least systematic, the reports of boards of trade, &c., are especially full and satisfactory. The recent exports of breadstuffs and their preparations during the same period, are as follows: 1869, $53,254,474; 1870, $72,488,775; 1871, $79,519,387; 1872, $85,155,523; 1873, $99,090,831. In this increase the most noticeable feature is the enormous enlargement of raw grain exports. While the export of flour has fluctuated wheat has rapidly increased. The other cereals show a great enhancement, though some of them have considerably fluctuated. During the last six calendar years the total export of all kinds of grain, including flour reduced to wheat, has tripled in volume, as is shown by the following statements.

The following table shows the export of flour and grain for ten fiscal years, ending June 30, 1873:

Years.	Flour.	Wheat.	Total wheat and flour.	Corn.	Oats.	Barley.	Rye.	Total cereals.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1864......	3, 557, 347	23, 681, 712	41, 468, 447	4, 096, 684	305, 755	66, 482	154, 960	46, 092, 328
1865......	2, 604, 542	9, 937, 152	22, 959, 862	2, 812, 726	318, 117	44, 248	132, 459	26, 267, 417
1866......	2, 183, 050	5, 579, 103	16, 494, 353	13, 516, 651	1, 245, 658	....	417, 127	31, 673, 789
1867......	1, 300, 106	6, 146, 411	12, 646, 941	14, 889, 823	825, 895	....	147, 353	28, 510, 012
1868......	2, 076, 423	15, 940, 899	26, 328, 014	11, 147, 490	122, 554	9, 810	501, 349	38, 104, 217
1869......	2, 431, 873	17, 557, 836	29, 687, 201	7, 047, 197	481, 871	59, 077	49, 501	37, 324, 847
1870......	3, 463, 333	36, 584, 115	53, 900, 780	1, 392, 115	121, 517	255, 490	157, 606	55, 827, 608
1871......	3, 653, 841	34, 304, 906	52, 574, 111	9, 826, 309	147, 572	340, 093	49, 674	62, 937, 759
1872......	2, 514, 535	26, 423, 080	38, 995, 755	34, 491, 650	262, 975	86, 891	794, 967	74, 632, 238
1873......	2, 562, 086	39, 204, 285	52, 014, 715	38, 541, 930	714, 072	482, 410	562, 021	92, 315, 148

The exports of the last six calendar years were as follows:

Years.	Flour.	Wheat.	Wheat and flour.	Corn.	Oats.	Barley.	Rye.	Total cereals.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels:*
1868...	2, 155, 449	10, 917, 402	21, 684, 647	9, 869, 920	437, 553	28, 178	157, 528	32, 177, 826
1869...	3, 218, 341	34, 345, 708	50, 437, 413	4, 072, 913	184, 612	253, 284	149, 556	55, 097, 778
1870...	3, 357, 957	33, 547, 637	50, 137, 422	2, 250, 573	150, 005	329, 907	89, 830	52, 957, 737
1871...	3, 324, 240	33, 199, 769	49, 821, 964	22, 107, 843	227, 798	105, 817	501, 939	72, 765, 361
1872...	2, 298, 217	28, 509, 405	40, 000, 490	45, 018, 033	382, 349	369, 125	646, 023	86, 415, 720
1873...	3, 201, 974	56, 287, 485	72, 337, 355	30, 586, 077	926, 608	450, 077	1, 107, 486	105, 407, 603

The enormous increase of 1873 is occasioned by the short crops of Europe and the heavy demand created by their deficit. The figures, however, indicate a steady increase in our foreign exports of breadstuffs, independent of exceptional causes, such as the present short crops of Europe.

Our internal grain movements show the influence of new and important commercial interests. The State of New York no longer controls our internal commerce. The report for 1872 of the New York Produce Exchange gives an interesting *résumé* of the rival agencies which, since 1856, have been competing with the canals and railways of the Empire State for the transportation of the vast grain products of the West and Northwest. In that year the shipment by the Saint Lawrence River began to loom up into considerable importance. During the four years closing with 1859 these shipments amounted to 19,193,440 bushels; in the four years closing with 1871 they had risen to 50,885,790 bushels, an increase of 165 per cent. There is also an increasing diversion of western trade by the lakes through Ogdensburgh to the New England States. Coeval with the rise of this Saint Lawrence trade five great lines of railway completed their organization for freight transportation to tide-water at Baltimore, Philadelphia, New York, Boston, Portland, and Montreal. The Chesapeake and Ohio has just constructed a still shorter line to Cincinnati, Louisville, and Saint Louis, along the southern part of the great wheat-bearing zone. The receipts of western cereals, flour included, at Philadelphia, rose from 7,260,515 bushels in 1866, to 24,117,150 in 1872, an increase of 232 per cent. in six years, while the receipts at New York increased from 176,343,636 bushels in 1858 to 222,075,838 in 1871, or only 26 per cent. in thirteen years. The receipts at Baltimore rose from 8,197,130 bushels in 1866 to 20,571,499 bushels in 1872, or 123 per cent. The receipts at Montreal during the same time rose from 10,394,454 bushels to 17,547,428 bushels, or over 70 per cent. in six years. Other points of export show a rapid gain upon the cereal trade of New York, indicating a less centralized and more expansive spirit of commercial enterprise.

Among ports of original shipment or of transhipment in the interior, the trade of Buffalo shows a steady increase, the receipts by lake having risen from 64,603,890 bushels in 1863 to 73,577,025 in 1873. The receipts at Cincinnati in the same period rose from 8,000,000 to 10,000,000 of bushels; Toledo, from 12,000,000 to 22,000,000; Chicago, from 57,000,000 to 99,000,000; Milwaukee, from 17,000,000 to 38,000,000; Saint Louis, from 17,000,000 in 1865 to 27,000,000 in 1873; San Francisco, from 4,000,000 to 19,000,000, &c.

The following *résumé* of receipts and shipments of flour and grain at the leading breadstuff markets has been compiled from official reports, either of the National Government or of boards of trade and chambers of commerce:

NEW YORK.

New York is still the leading point of foreign shipment, sending out, during 1873, about one-half of the entire export of flour, wheat, and corn, one-twentieth of the oats, one-eleventh of the barley, and nearly all of the rye. Of the entire national export of 105,407,603 bushels of grain, (flour being reduced to wheat-bushels,) New York is credited with 53,654,033 bushels, or about half. During the last six calendar years New York has exported the following percentages of the entire export of the country, viz: 1868, 59 per cent.; 1869, 50 per cent.; 1870, 55 per cent.; 1871, 59 per cent.; 1872, 53 per cent.; 1873, 50.9 per cent. The receipts of flour during these years have been more than double the

foreign shipments. The receipts of wheat have exceeded the exports from 21 to 117 per cent.; the exports of corn have varied from one-twentieth to three-fifths of the receipts; the exports of oats and barley have been but an inappreciable portion of the receipts, while nearly the whole of the rye received has been shipped to foreign countries.

The total value of breadstuffs exported from New York during the fiscal year ending June 30, 1873, was $50,101,028.

The following tables show the grain movements at New York during thirteen calendar years:

Flour and Wheat.

Years.	FLOUR.		Average price of extra State.	WHEAT.		Average price per bushel of Milwaukee spring No. 1.
	Receipts.	Exports.		Receipts.	Exports.	
	Barrels.	*Barrels.*	*Per barrel.*	*Bushels.*	*Bushels.*	
1861	5, 013, 953	3, 121, 053	$5 35	28, 741, 909	28, 889, 914	$1 19
1862	5, 257, 008	3, 070, 068	5 49	27, 069, 259	26, 262, 699	1 21
1863	4, 517, 356	2, 506, 725	6 15	17, 901, 208	15, 623, 586	1 54
1864	3, 956, 062	2, 019, 353	8 63	13, 281, 068	12, 048, 660	1 97
1865	3, 586, 549	1, 400, 810	8 06	8, 674, 829	2, 690, 202	1 69
1866	2, 721, 657	910, 508	8 94	5, 766, 664	626, 713	2 08
1867	2, 605, 849	940, 318	10 75	9, 706, 804	4, 665, 315	2 42
1868	2, 855, 986	1, 105, 819	9 13	12, 950, 068	5, 969, 878	2 15
1869	3, 537, 539	1, 584, 735	6 62	23, 952, 250	17, 526, 900	1 52
1870	4, 169, 933	2, 008, 835	5 59	23, 903, 259	18, 570, 561	1 29
1871	3, 579, 859	1, 618, 814	6 48	26, 794, 864	22, 027, 561	1 52¼
1872	3, 042, 907	1, 202, 792	7 03	16, 238, 433	13, 299, 320	1 62¼
1873	3, 546, 568	1, 655, 331	....	35, 559, 870	27, 801, 829	....

Corn and Oats.

Years.	CORN.			OATS.		
	Receipts.	Exports.	Average prices.	Receipts.	Exports.	Average prices.
	Bushels.	*Bushels.*	*Per bushel.*	*Bushels.*	*Bushels.*	*Bushels.*
1861	23, 189, 469	12, 456, 265	$0 57	4, 031, 395	160, 825	....
1862	17, 290, 114	11, 891, 001	61	5, 051, 874	210, 669	$0 36
1863	13, 933, 075	7, 555, 661	72	11, 121, 835	126, 556	77
1864	7, 281, 880	1, 124, 629	1 51	12, 736, 456	42, 135	92
1865	14, 701, 967	4, 473, 428	1 10	9, 952, 568	94, 567	74
1866	22, 218, 519	11, 625, 826	91	8, 703, 220	1, 190, 583	55
1867	15, 024, 221	8, 455, 920	1 64	8, 054, 164	144, 665	75
1868	18, 995, 072	6, 812, 237	1 19	10, 278, 781	94, 507	82
1869	10, 691, 749	1, 800, 122	1 01	8, 721, 608	40, 393	73
1870	9, 229, 911	483, 281	1 01⅓	9, 665, 954	31, 251	69
1871	26, 816, 086	12, 318, 637	75 7/6	12, 423, 629	47, 757	60[1]
1872	40, 800, 939	25, 652, 603	67⅜	12, 442, 127	32, 718	....
1873	24, 576, 345	15, 416, 787	....	11, 235, 420	49, 573	....

Barley and Rye.

Years.	BARLEY.		RYE.	
	Receipts.	Exports from New York.	Receipts.	Exports from New York.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1862	1, 151, 818	42, 061	932, 084	1, 001, 849
1863	1, 606, 983	52, 349	428, 955	416, 369
1864	1, 702, 898	150	519, 322	588
1865	2, 503, 997	....	946, 152	198, 348
1866	5, 140, 203	1, 320, 842	1, 277, 701	248, 646
1867	2, 223, 769	886, 893	748, 984	473, 260
1868	2, 274, 255	90	775, 612	152, 993
1869	2, 524, 663	....	365, 468	142, 542
1870	3, 958, 239	....	563, 184	225, 050
1871	3, 011, 950	104, 495	1, 063, 033	525, 511
1872	3, 964, 441	17, 402	491, 851	623, 355
1873	2, 444, 206	40, 040	995, 447	1, 069, 149

The comparative stocks of flour and grain in New York at the close of the last five years were as follows:

	1869.	1870.	1871.	1872.	1873.
Flour.......barrels..	443, 478	565, 069	356, 571	363, 624	269, 751
Wheat.......bushels..	4, 386, 331	3, 700, 006	4, 227, 181	2, 132, 740	1, 258, 600
Corn.......do.....	672, 111	303, 033	1, 439, 804	5, 910, 670	1, 251, 500
Oats.......do.....	1, 907, 059	2, 269, 055	2, 874, 586	1, 620, 360	471, 600
Barley.......do.....	857, 987	1, 461, 192	565, 772	1, 286, 447	194, 400
Rye.......do.....	39, 891	192, 070	573, 527	96, 240	14, 630

BOSTON.

The receipts of flour and grain at this port show a gradual increase, while the exports are stationary or declining, The exports of the last fiscal year embraced 947,584 bushels of corn, 72,422 barrels of corn-meal, 176,865 bushels of wheat, 171,504 barrels of flour, &c., the total declared value being $2,550,866. The following tables show the grain movements, in part, of the last thirteen calendar years.

Flour and wheat.

Years.	FLOUR.			WHEAT.		
	Receipts.	Shipments, foreign and coastwise.	Range of prices.	Receipts.	Exports.	Range of prices.
	Barrels.	*Barrels.*		*Bushels.*	*Bushels.*	
1861..........	1, 433, 999	389, 730	$4 50 to $9 00	29, 388	20, 650	....
1862..........	1, 365, 832	555, 591	4 65 to 9 75	63, 015	45, 544	....
1863..........	1, 444, 063	433, 957	5 00 to 11 25	44, 760	1, 483	....
1864..........	1, 318, 403	341, 932	7 00 to 15 00	55, 069	6	....
1865..........	1, 426, 373	243, 667	6 25 to 17 00	499	897	....
1866..........	1, 504, 253	232, 800	8 25 to 19 00	16, 537	478	....
1867..........	1, 402, 826	253, 319	9 00 to 21 00	159, 421	24, 077	....
1868..........	1, 467, 681	249, 840	6 00 to 17 00	165, 240	....	....
1869..........	1, 479, 975	219, 087	4 75 to 14 25	369, 059	....	....
1870..........	1, 562, 579	219, 511	4 50 to 10 00	213, 471	12	....
1871..........	1, 539, 843	244, 550	5 25 to 11 00	492, 429	191, 486	$1 10 to $1 85
1872..........	1, 586, 017	217, 586	5 25 to 13 00	402, 426	151, 860	1 60 to 2 50
1873..........	1, 795, 272	231, 361	4 50 to 13 00	880, 747	486, 128	1 45 to 2 00

Corn, oats, rye, and barley.

Years.	CORN.			OATS.		RYE.		BARLEY.
	Receipts.	Shipments.	Range of prices.	Receipts.	Range of prices.	Receipts.	Range of prices.	Receipts.
	Bushels.	*Bushels.*		*Bushels.*		*Bushels*		*Bushels.*
1861....	1, 982, 902	64, 913	$0 45 to $0 80	1, 047, 345	$0 32 to $0 48	33, 156	$0 58 to $0 82	....
1862....	1, 889, 021	78, 385	53 to 90	1, 168, 991	38 to 66½	39, 973	75 to 1 04	....
1863....	1, 614, 064	25, 027	74 to 1 42	1, 444, 608	50 to 92	27, 312	95 to 1 48	....
1864....	1, 604, 639	35, 607	1 29 to 2 17	1, 746, 932	82 to 1 10	34, 265	1 30 to 2 30	113, 887
1865....	1, 738, 817	30, 394	80 to 2 07	2, 126, 356	50 to 1 00	32, 803	80 to 1 92	194, 409
1866....	2, 157, 292	37, 027	80 to 1 40	1, 219, 717	45 to 85	37, 864	90 to 1 60	190, 650
1867....	2, 361, 313	27, 529	1 10 to 1 65	1, 411, 176	65 to 95	24, 311	1 25 to 1 85	317, 911
1868....	2, 470, 148	46, 271	95 to 1 42	1, 294, 446	70 to 1 00	27, 714	1 50 to 2 00	212, 167
1869....	2, 343, 840	16, 187	80 to 1 35	1, 400, 412	60 to 86	32, 992	1 15 to 1 65	316, 871
1870....	2, 429, 942	18, 854	78 to 1 25	2, 166, 603	52 to 82	34, 480	90 to 1 20	390, 514
1871....	3, 814, 729	804, 143	72 to 93	2, 416, 273	46 to 75	36, 384	70 to 1 20	403, 869
1872....	5, 090, 755	1, 673, 769	64 to 81	2, 725, 641	38 to 65	13, 989	85 to 1 10	539, 038
1873....	3, 558, 363	162, 729	60 to 90	3, 663, 364	42 to 65	33, 335	80 to 1 10	332, 846

PORTLAND, MAINE.

The receipts of flour and grain at this port show a decline, the aggregates of 1872 being a million bushels less than those of 1865. Since 1869 flour and wheat have been stationary, while corn, oats, and barley show a very considerable increase. The receipts for the six years named were as follows:

Years.	Flour.	Wheat.	Corn.	Oats.	Rye.	Barley.	Total grain.	Total grain and flour.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1865	549, 963	42, 530	500, 000	1, 754, 950	4, 053	130, 200	2, 431, 733	5, 181, 548
1866	397, 850	98, 662	45, 368	626, 803	4, 578	67, 042	832, 453	2, 821, 703
1867	602, 269	132, 180	4, 059	1, 726, 052	17, 705	178, 115	2, 058, 111	5, 069, 456
1868	669, 045	226, 127	8, 283	414, 754	57, 580	35, 044	748, 768	4, 086, 993
1869	439, 648	268, 246	1, 436	127, 755	1, 416	14, 256	413, 109	2, 611, 349
1871	482, 523	263, 898	810, 063	197, 730	1, 100	52, 279	1, 225, 070	3, 711, 846
1872	488, 764	280, 676	806, 437	322, 173	803	59, 264	1, 469, 853	4, 071, 792

The foreign exports are small, embracing, during the fiscal year ending June 30, 1872, 200 bushels of corn, 380 barrels of corn-meal, 19,068 bushels of wheat, 4,517 barrels of flour, &c., the total declared value of which was $102,349.

BUFFALO.

Buffalo is a great entrepôt of the grain-trade. The following tables show the receipts by lake and shipments by canal for eleven years, and do not include the railway shipments *in transitu* from points further west. These would more than double the aggregates. In some of the commercial reports these are included, thus recognizing the principle that produce and merchandise passing any particular point, though not transhipped or in any way handled, should be regarded as a part of the commerce of that point. This, however, is, to say the least, a doubtful construction, not generally acquiesced in. It should be settled by some competent authority.

Flour and wheat.—The receipts by lake and shipments by canal of flour and wheat during eleven years were as follows:

Years.	FLOUR.		WHEAT.		TOTAL WHEAT.*	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Barrels.	*Barrels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1863	2, 978, 089	469, 792	21, 240, 348	19, 404, 308	36, 130, 793	21, 753, 368
1864	2, 028, 520	126, 820	17, 677, 549	16, 148, 386	27, 820, 149	16, 782, 486
1865	1, 788, 393	142, 018	13, 437, 888	10, 202, 154	22, 379, 853	10, 507, 936
1866	1, 313, 543	52, 325	10, 479, 694	7, 772, 217	17, 047, 409	8, 033, 832
1867	1, 440, 056	15, 468	11, 879, 685	10, 109, 718	19, 079, 965	10, 187, 058
1868	1, 502, 731	5, 774	12, 555, 215	10, 360, 030	20, 068, 870	20, 097, 740
1869	1, 598, 487	51, 928	19, 228, 403	16, 363, 480	27, 220, 838	27, 480, 478
1870	1, 470, 391	76, 471	20, 536, 722	16, 738, 613	27, 908, 771	28, 281, 126
1871	1, 278, 077	47, 731	22, 606, 217	19, 028, 316	28, 996, 602	19, 266, 971
1872	762, 502	5, 172	14, 304, 942	11, 001, 969	18, 117, 452	11, 026, 929
1873	1, 259, 205	113, 616	30, 618, 372	24, 569, 088	36, 914, 397	24, 909, 936

* Flour reduced to wheat-bushels.

Corn, oats, barley, and rye.—The receipts by lake and shipments by canal of corn, oats, barley, and rye during eleven years were as follows:

Years.	CORN.		OATS.		BARLEY.*	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1863	20, 086, 952	18, 980, 442	7, 322, 187	6, 527, 598	641, 649	419, 157
1864	10, 478, 681	9, 757, 022	11, 682, 637	11, 178, 564	468, 067	†235, 133
1865	19, 840, 931	18, 474, 338	8, 494, 799	7, 900, 451	820, 563	‡514, 951
1866	27, 894, 798	24, 548, 596	10, 227, 472	8, 922, 433	1, 606, 384	1, 301, 715
1867	17, 873, 638	14, 931, 812	10, 933, 166	9, 409, 686	1, 802, 598	1, 206, 733
1868	16, 804, 067	15, 999, 136	11, 492, 472	10, 423, 504	637, 124	209, 218
1869	11, 549, 403	7, 816, 960	5, 459, 347	3, 983, 046	651, 339	82, 429
1870	9, 410, 128	5, 911, 668	8, 846, 983	5, 572, 254	1, 821, 154	831, 024
1871	26, 110, 769	20, 695, 305	9, 006, 409	6, 649, 439	1, 946, 923	825, 420
1872	34, 643, 187	30, 034, 606	6, 050, 045	4, 598, 237	3, 088, 925	1, 729, 972
1873	28, 550, 828	21, 768, 053	5, 972, 346	3, 225, 926	1, 232, 507	358, 764

* This includes also receipts by rail from Canada.
† Including 137,388 bushels of barley-malt.
‡ Including 223,590 bushels of barley-malt.

Years.	RYE.		TOTAL GRAIN.*	
	Receipts.	Shipments.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1863	422, 309	361, 718	64, 603, 890	48, 042, 283
1864	633, 727	517, 131	51, 083, 261	38, 470, 336
1865	817, 676	629, 758	52, 353, 822	38, 027, 434
1866	1, 245, 485	972, 647	58, 021, 548	43, 779, 223
1867	1, 010, 643	736, 578	50, 710, 007	36, 471, 867
1868	947, 323	633, 899	50, 059, 856	47, 363, 497
1869	126, 093	76, 792	45, 007, 020	39, 439, 705
1870	626, 154	378, 322	48, 613, 190	40, 974, 394
1871	1, 095, 039	986, 517	67, 155, 472	48, 423, 652
1872	301, 809	210, 715	62, 201, 418	47, 600, 459
1873	906, 947	801, 481	73, 577, 025	51, 064, 160

* Including flour reduced to wheat-bushels.

NOTE.—In addition to the barley exports there were shipped 160,610 bushels of barley-malt in 1870; 205,313 bushels in 1871; 261,036 bushels in 1872; and 130,764 bushels in 1873.

OGDENSBURGH.

The receipts of flour and grain for seven years were as follows:

Years.	Flour.	Wheat.	Corn.	Oats.	Rye.	Barley.	Total grain.	Total grain and flour.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1866	1, 113, 543	....	....	....	....	....	2, 774, 709	3, 802, 589
1867	1, 440, 056	....	....	....	....	....	2, 587, 515	3, 638, 995
1868	1, 502, 731	....	....	....	....	....	2, 701, 471	3, 828, 826
1869	1, 598, 482	....	....	....	....	....	2, 884, 701	4, 124, 176
1870	2, 791, 234	959, 103	2, 037, 841	397, 722	4, 256	170, 798	3, 569, 990	4, 652, 500
1871	2, 715, 743	963, 295	2, 651, 989	170, 060	5, 025	157, 865	3, 954, 234	4, 952, 259
1872	2, 029, 602	937, 374	621, 113	947, 895	....	140, 030	2, 646, 412	3, 540, 227

OSWEGO.

The receipts of flour and grain for eight years were as follows:

Years.	Flour.	Wheat.	Corn.	Oats.	Rye.	Barley.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1866	8, 309	5, 517, 329	3, 492, 207	356, 538	572, 394	4, 304, 803
1867	3, 277	5, 279, 286	3, 420, 784	275, 484	238, 177	2, 720, 334
1868	1, 170	6, 970, 334	3, 679, 346	683, 154	168, 780	2, 134, 310
1869	3, 526	7, 789, 699	1, 118, 170	62, 331	333, 942	3, 199, 747
1870	5, 752	6, 850, 412	940, 484	427, 684	310, 107	3, 545, 571
1871	1, 552	6, 768, 852	3, 416, 765	124, 800	304, 262	3, 472, 288
1872	110	4, 153, 484	1, 921, 901	89, 801	81, 773	2, 791, 038
1873	....	4, 284, 461	1, 450, 800	43, 193	254, 549	2, 377, 348

The shipments by canal for three years were as follows:

Years.	Flour.	Wheat.	Corn.	Oats.	Rye.	Barley.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1871	92, 997	4, 105, 784	2, 507, 779	112, 913	223, 235	3, 028, 164
1872	44, 201	1, 928, 859	969, 587	42, 750	241, 125	2, 590, 500
1873	37, 241	1, 775, 398	337, 729	41, 906	214, 998	1, 930, 734

PHILADELPHIA.

Flour, wheat, and corn.—The receipts and shipments of flour, wheat, and corn for nine calendar years were as follows:

Years.	FLOUR.		WHEAT.		CORN.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Barrels.	*Barrels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1864	903, 447	294, 798	2, 465, 790	526, 448	1, 604, 415	83, 050
1865	715, 398	134, 917	1, 802, 040	9, 945	1, 506, 305	137, 359
1866	574, 512	78, 735	1, 219, 670	26, 034	1, 603, 394	752, 888
1867	496, 979	....	1, 207, 892	....	2, 464, 125	....
1868	694, 860	....	2, 194, 160	....	2, 960, 127	....
1869	876, 550	....	2, 984, 600	....	3, 240, 140	....
1870	969, 447	121, 910	3, 394, 400	374, 300	3, 080, 250	66, 338
1871	950, 065	136, 145	3, 901, 690	1, 153, 167	6, 160, 300	1, 644,779
1872	987, 450	113, 036	4, 160, 800	412, 761	8, 137, 380	3, 462, 473

Oats, barley, and rye.—The receipts of oats, barley, and rye for seven calendar years were as follows:

Years	Oats.	Rye.	Barley.
	Bushels.	*Bushels.*	*Bushels.*
1866	1, 570, 218	279, 673	....
1867	1, 439, 940	260, 770	....
1868	2, 437, 680	762, 410	....
1869	2, 660, 570	951, 465	....
1870	2, 360, 543	720, 333	775, 850
1871	4, 103, 400	370. 530	816, 200
1872	5. 830, 400	320, 940	730, 380

ERIE.

The receipts of flour and grain for five years were as follows:

Years.	Flour.	Wheat.	Corn.	Oats.	Rye.	Barley.	Total grain.	Total grain and flour.*
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1868	117, 759	424, 256	517, 684	314, 319	32, 239	52, 822	1, 341, 320	1, 930, 115
1869	156, 328	672, 556	637, 497	130, 296	....	188, 091	1, 629, 467	2, 411, 107
1870	229, 119	770, 261	554, 228	521, 000	16, 395	153, 642	2, 015, 526	3, 161, 121
1871	167, 610	731, 898	301, 785	42, 528	10, 000	159, 600	1, 245, 811	2, 083, 861
1872	178, 763	937, 374	621, 113	947, 895	....	140, 030	2, 646, 412	3, 540, 227

*Reduced to wheat-bushels.

BALTIMORE.

Flour and grain.—The receipts and shipments of flour and receipts of grain for six years were as follows:

Years.	Flour.		Wheat.	Corn.	Oats.	Rye.
	Receipts and city manufactures.	Shipments, foreign.	Receipts.	Receipts.	Receipts.	Receipts.
	Barrels.	*Barrels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1868	888, 410	....	2, 293, 799	4, 177, 264	1, 146, 175	136, 270
1869	1, 123, 028	....	3, 249, 995	3, 923, 563	1, 171, 424	177, 246
1870	1, 177, 314	338, 932	3, 039, 357	3, 831, 676	1, 243, 720	77, 778
1871	1, 123, 028	503, 119	4, 076, 017	5, 735, 921	1, 833, 409	88, 956
1872	1, 175, 967	282, 553	2, 456, 100	9, 045, 465	1, 959, 161	90, 938
1873	1, 312, 612	359, 566	2, 810, 917	8, 330, 449	1, 255, 072	100, 519

CINCINNATI.

The statistics of Cincinnati, prepared under the direction of the Chamber of Commerce, are arranged in "commercial years," closing August 31 of each calendar year. The latest report received, therefore, embraces the movement of but a small portion of the crops of 1873. The business of the last commercial year shows a marked increase in the aggregate of flour and grain over that of any previous year. The shipments of flour have been mostly to the South. A growing demand for spring-wheat flour is noted, and an increase of receipts from the Northwest. The importation and consumption of barley is the most noticeable feature of the trade. The corn-trade, representing the enormous crop of 1872, was also very heavy. The oats and rye movements show great increase, but the trade in raw grain was mostly consumptive. Cincinnati is not a great shipping point for cereals.

Flour and wheat.—The receipts and shipments of flour and wheat, with the average prices of superfine flour and wheat, during the last seventeen commercial years, were as follows:

Years.	Flour.			Wheat.			Total wheat and flour.	
	Receipts.	Shipments.	Av. annual prices of superfine flour.	Receipts.	Shipments.	Av. price of red winter No. 1.	Receipts.	Shipments.
	Barrels.	*Barrels.*	*Dollars.*	*Bushels.*	*Bushels.*	*Dollars.*	*Bushels.*	*Bushels.*
1856–'57	485, 089	416, 789	5 77	737, 723	394, 920	1 18	2, 963, 168	2, 478, 865
1857–'58	633, 318	609, 210	4 00	1, 211, 543	631, 660	77	4, 378, 133	3, 677, 710
1858–'59	558, 173	562, 139	5 33	1, 274, 685	609, 848	1 15	4, 065, 550	3, 420, 533
1859–'60	517, 229	478, 308	4 60	1, 057, 118	321, 495	1 17	3, 643, 263	2, 713, 035
1860–'61	490, 619	426, 625	4 45	1, 129, 007	525, 065	93	3, 582, 102	2, 658, 190
1861–'62	588, 245	460, 574	4 08	2, 174, 924	1, 293, 680	86	5, 116, 149	3, 596, 550
1862–'63	619, 710	404, 570	5 03	1, 741, 491	1, 177, 106	1 04	4, 840, 041	3, 199, 158
1863–'64	546, 983	393, 268	6 39	1, 650, 759	943, 737	1 41½	4, 385, 674	1, 910, 077
1864–'65	671, 900	436, 186	7 67	1, 678, 395	686, 893	1 78½	5, 037, 895	2, 867, 823
1865–'66	659, 046	514, 450	7 32	1, 545, 892	873, 775	2 27	4, 841, 122	3, 446, 025
1866–'67	577, 296	412, 008	9 45	1, 474, 987	972, 982	2 29	4, 361, 467	3, 033, 022
1867–'68	522, 297	352, 896	9 18	780, 933	406, 349	2 31¼	3, 392, 418	2, 170, 829
1868–'69	571, 280	387, 083	5 08½	1, 075, 348	702, 622	1 57	3, 931, 748	2, 638, 037
1869–'70	774, 344	576, 677	4 62	1, 195, 341	806, 775	1 14 5-6	5, 067, 061	3, 690, 150
1870–'71	705, 579	538, 498	5 00	866, 459	409, 893	1 27⅛	4, 394, 354	3, 102, 383
1871–'72	582, 930	410, 501	6 06	762, 144	323, 405	1 57 7-10	3, 676, 794	2, 375, 910
1872–'73	765, 469	560, 829	5 56½	860, 454	412, 722	*1 50 3-10	4, 688, 799	3, 216, 866

* Red winter No. 2.

Corn and oats.—The receipts, shipments, and annual average prices of corn and oats for seventeen commercial years were as follows:

Years.	CORN.		Annual average prices of prime mixed corn.	OATS.		Annual average prices of No. 1 mixed oats.
	Receipts.	Shipments.		Receipts.	Shipments.	
	Bushels.	*Bushels.*		*Bushels.*	*Bushels.*	
1856–'57	1, 673, 363	162, 940	$0 59	534, 312	70, 116	$0 46
1857–'58	1, 090, 236	38, 314	42	598, 950	10, 398	36
1858–'59	1, 139, 922	57, 006	72	557, 701	27, 415	57
1859–'60	1, 346, 208	97, 734	50	894, 515	111, 823	43
1860–'61	1, 340, 690	254, 538	34	838, 451	134, 311	26⅔
1861–'62	1, 708, 292	282, 300	31	1, 338, 950	450, 851	30
1862–'63	1, 504, 430	531, 868	53⅗	1, 312, 000	937, 139	58½
1863–'64	1, 817, 046	890, 520	1 03½	1, 423, 813	851, 392	78½
1864–'65	1, 262, 198	685, 506	77½	2, 358, 053	1, 739, 676	52¼
1865–'66	1, 427, 766	611, 746	54½	1, 331, 803	187, 091	42
1866–'67	1, 820, 955	1, 099, 884	79¼	1, 246, 375	295, 820	57
1867–'68	1, 405, 366	556, 172	92½	912, 013	74, 098	60½
1868–'69	1, 508, 509	188, 784	73½	1, 125, 900	218, 300	63¾
1869–'70	1, 979, 645	384, 500	83⅓	1, 470, 075	188, 839	51⅓
1870–'71	2, 068, 900	672, 628	56	1, 215, 794	244, 169	46
1871–'72	1, 829, 866	246, 632	49	1, 160, 053	230, 963	37
1872–'73	2, 259, 544	324, 183	42⅗	1, 520, 979	324, 718	$36\frac{1}{10}$

CINCINNATI.

Rye and barley.—The receipts, shipments, and annual average prices of rye and barley for seventeen commercial years were as follows:

Years.	RYE.			BARLEY.			TOTAL GRAIN.	
	Receipts.	Shipments.	Av. annual price No. 1.	Receipts.	Shipments.	Av. annual price No. 1.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Per bushel.*	*Bushels.*	*Bushels.*	*Per bushel.*	*Bushels.*	*Bushels.*
1856–'57	113, 818	....	....	381, 060	....	$1 58	5, 665, 771	2, 711, 271
1857–'58	64, 385	19, 640	....	400, 967	80, 226	58	6, 532, 671	2, 826, 288
1858–'59	82, 572	30, 127	....	456, 731	119, 204	67	6, 301, 476	3, 654, 285
1859–'60	131, 487	59, 177	....	352, 829	95, 160	76	6, 368, 302	3, 076, 929
1860–'61	157, 509	69, 075	....	493, 214	58, 578	69	6, 411, 966	3, 174, 692
1861–'62	247, 187	94, 436	....	323, 884	42, 052	60	8, 734, 452	4, 469, 089
1862–'63	138, 935	25, 415	....	336, 176	18, 214	1 36	8, 131, 582	4, 711, 794
1863–'64	137, 852	24, 340	....	379, 432	18, 388	1 51	8, 143, 817	3, 694, 717
1864–'65	190, 567	15, 000	....	542, 712	29, 556	1 28	9, 391, 425	5, 337, 561
1865–'66	406, 188	54, 381	....	891, 833	109, 012	1 41	8, 948, 712	4, 408, 255
1866–'67	409, 171	106, 319	....	673, 806	65, 832	1 52¾	8, 511, 774	4, 600, 877
1867–'68	218, 385	73, 342	....	602, 813	129, 278	2 11	6, 530, 995	3, 003, 719
1868–'69	385, 672	222, 913	....	853, 182	67, 246	2 36⅔	7, 805, 011	3, 335, 280
1869–'70	237, 885	53, 751	$0 93	836, 331	56, 088	1 26½	9, 590, 997	4, 373, 328
1870–'71	289, 775	51, 026	91	800, 968	17, 330	1 00⅓	8, 769, 811	4, 087, 536
1871–'72	357, 309	110, 464	85	1, 177, 306	26, 984	78	8, 201, 328	2, 990, 953
1872–'73*	426, 660	61, 577	75	1, 228, 245	37, 456	$86\frac{7}{10}$	10, 124, 227	3, 964, 800

CLEVELAND.

The receipts of flour and grain for seven calendar years were as follows:

Years.	Flour.	Wheat.	Corn.	Oats.	Rye.	Barley.	Total grain.	Total grain and flour.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1866	543, 053	3, 394, 523	1, 072, 366	935, 168	95, 629	233, 380	5, 731, 066	8, 446, 331
1867	662, 272	1, 858, 821	2, 547, 035	1, 320, 870	48, 283	233, 165	6, 007, 825	9, 319, 185
1868	737, 204	2, 225, 654	3, 089, 135	1, 565, 870	89, 633	389, 192	7, 359, 484	11, 045, 501
1869	800, 000	3, 200, 000	1, 400, 000	900, 000	100, 000	400, 000	6, 000, 000	10, 000, 000
1870*	11, 941	152, 100	29, 717	....	....	239, 910	427, 727	487, 432
1871*	20, 991	190, 265	100, 945	36, 641	....	222, 748	558, 699	663, 654
1872*	17, 765	547, 098	30, 304	37, 283	11, 736	58, 765	692, 186	780, 611

* By lake only.

TOLEDO.

The receipts of flour and grain for seven calendar years were as follows:

Years.	Flour.	Wheat.	Corn.	Oats.	Rye.	Barley.	Total grain.	Total grain and flour.
	Barrels.	*Bushels*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1866	800, 580	2, 185, 885	4, 535, 473	1, 316, 249	122, 737	501, 160	8, 661, 504	12, 664, 404
1867	717, 371	2, 301, 866	5, 794, 412	1, 059, 553	51, 817	337, 402	9, 545, 050	13, 131, 905
1868	868, 524	3, 095, 856	5, 217, 255	2, 161, 303	178, 100	628, 011	11, 280, 525	15, 623, 145
1869	906, 736	6, 810, 265	4, 563, 421	1, 414, 506	93, 524	87, 997	12, 969, 713	17, 503, 393
1870	1, 296, 260	6, 881, 471	6, 294, 032	4, 103, 139	94, 171	160, 397	17, 233, 210	23, 714, 510
1871	766, 697	6, 998, 255	6, 877, 157	3, 199, 267	37, 070	82, 692	17, 194, 441	21, 027, 926
1872	366, 260	3, 162, 575	13, 748, 369	3, 990, 514	22, 416	96, 581	21, 020, 455	22, 701, 755

CHICAGO.

The grain-trade of Chicago, amounting to a third of the entire commerce of the city, shows a great increase in the aggregate, and an increase in every kind of grain except corn and barley. The receipts of grain and flour reduced to grain, in 1873, amounted to 98,935,413 bushels valued at $63,500,000, the grandest grain movement in the world. The course of the grain-trade was remarkably regular and reasonably profitable. The markets have been less liable to fluctuations; dealers have relied more upon intrinsic values and less upon manipulation. The aggregates in the following tables include flour and grain passing through Chicago without transshipment. The Chicago Board of Trade very judiciously includes in its reports the quantity of flour manufactured by the city mills, a feature which would add greatly to the value of the commercial reports of eastern cities. The consumptive trade here bears but a small proportion to the shipment trade.

Flour and Wheat.—The receipts, manufactures, shipments, and prices of flour and wheat during the last twenty-two years were as follows:

Years.	FLOUR.				WHEAT.		
	Receipts.	Manufactured.	Shipments.	Range of prices of spring-wheat flour, medium to choice samples.	Receipts.	Shipments.	Range of prices, No. 1 spring.
	Barrels.	*Barrels.*	*Barrels.*		*Bushels.*	*Bushels.*	
1852	53, 337	70, 979	61, 196	....	937, 496	635, 996	....
1853	48, 297	82, 833	70, 984	....	1, 687, 465	1, 206, 163	....
1854	158, 575	86, 000	111, 627	....	3, 038, 955	2, 306, 925	....
1855	240, 662	79, 650	163, 419	....	7, 535, 097	6, 298, 155	....
1856	324, 921	86, 068	216, 389	....	8, 767, 760	8, 364, 420	....
1857	393, 934	96, 000	259, 648	....	10, 554, 761	9, 846, 052	....
1858	522, 137	140, 403	470, 402	....	9, 639, 614	8, 850, 257	....
1859	726, 321	161, 500	686, 351	....	8, 060, 766	7, 166, 696	....
1860	713, 348	232, 000	698, 132	....	14, 927, 083	12, 402, 197	....
1861	1, 479, 284	291, 852	1, 603, 920	....	17, 385, 002	15, 835, 953	....
1862	1, 666, 391	260, 980	1, 739, 849	....	13, 978, 116	13, 808, 898	....
1863	1, 424, 206	236, 261	1, 522, 085	....	11, 408, 116	10, 793, 295	....
1864	1, 205, 698	255, 056	1, 285, 343	....	12, 184, 977	10, 250, 026	....
1865	1, 134, 100	238, 820	1, 293, 428	....	9, 266, 410	7, 614, 887	....
1866	1, 847, 145	455, 522	1, 981, 525	$6 25 to $11 75	11, 978, 753	10, 118, 907	$1 19¼ to $2 23½
1867	1, 720, 001	574, 096	2, 015, 455	8 00 to 14 25	13, 695, 244	10, 557, 123	1 64½ to 2 70
1868	2, 192, 413	732, 740	2, 399, 619	5 50 to 11 00	14, 772, 094	10, 374, 683	1 08 to 2 10½
1869	2, 218, 822	543, 285	2, 339, 063	3 75 to 7 00	16, 876, 760	13, 244, 249	84¾ to 1 45
1870	1, 766, 037	443, 967	1, 705, 977	3 80 to 6 50	17, 394, 409	16, 432, 585	76¼ to 1 30
1871	1, 412, 177	327, 730	1, 287, 574	4 60 to 7 00	14, 439, 656	12, 905, 449	1 02 to 1 31½
1872	1, 532, 014	186, 968	1, 361, 328	5 25 to 8 50	12, 724, 141	12, 160, 046	1 03 to 1 52
1873	2, 487, 376	264, 363	2, 303, 490	4 62½ to 7 50	26, 266, 562	24, 455, 657	99 to 1 32*

* Spring-wheat No. 2.

Corn and oats.—The receipts, shipments, and prices of corn and oats for twenty-two years were as follows:

Year.	CORN. Receipts.	CORN. Shipments.	CORN. Range of prices.	OATS. Receipts.	OATS. Shipments.	OATS. Range of prices.
	Bushels.	*Bushels.*		*Bushels.*	*Bushels.*	
1852	2, 991, 011	2, 757, 011	....	2, 089, 941	2, 030, 317	....
1853	2, 869, 339	2, 780, 228	....	1, 875, 770	1, 748, 493	....
1854	7, 490, 753	6, 837, 890	....	4, 194, 385	3, 239, 987	....
1855	8, 537, 377	7, 517, 625	....	2, 947, 188	1, 888, 538	....
1856	11, 888, 398	11, 129, 668	....	2, 219, 987	1, 014, 637	....
1857	7, 409, 000	6, 814, 615	....	1, 707, 245	506, 778	....
1858	8, 252, 641	7, 726, 264	....	2, 883, 507	1, 519, 069	....
1859	5, 401, 870	4, 349, 360	....	1, 757, 696	1, 185, 703	....
1860	15, 862, 394	13, 700, 113	....	2, 198, 889	1, 091, 698	....
1861	26, 369, 989	24, 372, 725	....	2, 067, 018	1, 633, 237	....
1862	29, 574, 328	29, 452, 610	....	4, 688, 722	3, 112, 366	....
1863	26, 611, 653	25, 051, 450	....	11, 086, 131	9, 234, 858	....
1864	13, 807, 745	12, 235, 452	....	16, 351, 616	16, 567, 650	....
1865	25, 952, 201	25, 437, 241	....	11, 659, 080	11, 142, 140	....
1866	33, 543, 061	32, 753, 181	\$0 37 to \$0 97	11, 140, 264	9, 961, 215	\$0 22½ to \$0 49
1867	22, 772, 715	21, 267, 205	74¾ to 1 11½	12, 355, 806	10, 226, 026	39¼ to 71
1868	25, 570, 494	24, 770, 626	79 to 1 12	16, 032, 910	14, 440, 830	45 to 67
1869	23, 470, 800	21, 586, 808	53 to 91½	10, 611, 940	8, 800, 646	37 to 63½
1870	20, 189, 775	17, 777, 377	50 to 87½	10, 472, 078	8, 507, 735	35¼ to 51
1871	41, 853, 138	36, 716, 030	40½ to 56¼	14, 789, 414	12, 151, 247	30 to 50½
1872	47, 366, 087	47, 013, 552	31 to 47	15, 061, 715	12, 255, 537	21¼ to 41⅜
1873	38, 157, 232	36, 754, 943	30⅜ to 53	17, 888, 724	15, 694, 133	24½ to 38¾

CHICAGO.

Rye, barley, and all cereals.—The receipts and shipments of rye and barley, and the total receipts and shipments of all grains, including flour reduced to wheat-bushels, for twenty-two years were as follows:

Years.	RYE. Receipts.	RYE. Shipments.	BARLEY. Receipts.	BARLEY. Shipments.	TOTAL CEREALS.* Receipts.	TOTAL CEREALS.* Shipments.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1852	21, 015	17, 315	127, 028	79, 818	6, 406, 508	5, 826, 437
1853	86, 182	82, 162	192, 387	120, 267	6, 928, 459	6, 292, 233
1854	85, 691	41, 153	201, 764	148, 411	15, 725, 135	15, 132, 501
1855	68, 166	19, 326	201, 895	92, 011	20, 367, 702	16, 632, 750
1856	45, 707	591	128, 457	19, 051	24, 512, 454	21, 610, 312
1857	87, 711	....	127, 689	17, 993	21, 659, 109	18, 483, 678
1858	71, 012	7, 569	413, 812	132, 020	23, 610, 293	20, 587, 189
1859	231, 514	134, 404	652, 696	486, 218	19, 372, 986	16, 754, 136
1860	318, 976	156, 642	617, 619	267, 449	37, 235, 027	31, 108, 759
1861	490, 989	393, 813	457, 589	226, 594	53, 427, 365	50, 481, 862
1862	1, 038, 825	871, 976	872, 053	532, 195	57, 650, 804	56, 477, 110
1863	865, 508	651, 194	1, 280, 813	946, 223	57, 060, 722	54, 287, 345
1864	1, 060, 116	893, 492	1, 018, 813	345, 208	49, 848, 308	46, 718, 543
1865	1, 194, 834	991, 289	1, 774, 139	607, 484	54, 950, 114	52, 268, 181
1866	1, 679, 541	1, 444, 574	1, 742, 652	1, 300, 821	68, 396, 423	65, 486, 323
1867	1, 291, 821	1, 213, 389	2, 360, 984	1, 846, 891	60, 215, 774	55, 187, 909
1868	1, 583, 820	1, 202, 941	1, 915, 056	901, 183	69, 680, 233	63, 688, 358
1869	955, 201	798, 744	1, 513, 110	663, 753	63, 417, 510	56, 750, 515
1870	1, 093, 493	913, 629	3, 335, 653	2, 584, 692	60, 432, 574	54, 745, 903
1871	2, 011, 788	1, 325, 867	4, 069, 410	2, 908, 113	83, 518, 202	71, 800, 789
1872	1, 129, 086	776, 805	5, 251, 750	5, 032, 308	88, 426, 842	83, 362, 424
1873	1, 189, 464	960, 613	4, 240, 239	3, 366, 041	98, 935, 413	91, 597, 092

*Including flour reduced to wheat-bushels.

DETROIT.

The receipts of flour and grain for seven calendar years were as follows:

Receipts.	1867.	1868.	1869.	1870.	1871.	1872.	1873.
Flour ....barrels.	1,030,548	1,290,292	960,800	1,305,418	1,617,315	667,906	495,809
Wheat .....bushels..	1,460,997	2,145,172	2,233,000	2,602,118	4,341,722	3,381,274	2,747,719
Corn ....do..	899,416	1,421,774	437,323	3,263,215	5,157,784	1,646,725	2,246,888
Oats ....do..	337,976	962,102	360,105	1,398,672	3,675,749	1,040,303	1,419,009
Rye ....do..	4,960	1,901	2,800	5,118	19,044	24,485	27,581
Barley ....do..	246,052	385,506	256,144	489,655	562,256	363,652	415,994
Total grain ...do..	2,949,401	4,916,455	3,289,372	7,788,778	13,756,555	6,456,439	6,857,191
Flour* ....do..	5,152,740	6,451,460	4,804,000	6,257,090	8,068,575	3,339,530	2,479,095
Grand total ...do..	8,102,141	11,367,915	8,093,372	14,045,868	21,843,130	9,795,969	9,336,286

*Reduced to wheat-bushels.

MILWAUKEE.

The trade in cereals at Milwaukee exhibits an enormous increase, the receipts of flour and all grains in 1873 being 65 per cent. greater than those of the previous year. The secretary of the Chamber of Commerce shows that the direct shipments of wheat at Milwaukee exceed those of Chicago by 3,873,701 bushels. He objects to the high figures claimed by Chicago on the ground that these are obtained by confounding the direct shipments with shipments from other points passing through the city. While it is desirable to record these shipments *in transitu* for general statistics, they should not be regarded as any part of the commercial transactions of the points through which they pass without transshipment. Facts fully sustain the claim of Milwaukee to be the greatest primary grain-market in the world. Next to Saint Louis it is the greatest flour manufacturing city in the United States. The following tables show the grain movements of the last fifteen years:

Flour and wheat.—The receipts, manufactures, and shipments of flour and wheat for the last fifteen calendar years were as follows:

Years.	FLOUR.			WHEAT.	
	Receipts.	Manufactures.	Shipments.	Receipts.	Shipments.
	Barrels.	*Barrels.*	*Barrels.*	*Bushels.*	*Bushels.*
1859	239,952	142,500	282,956	5,580,681	4,732,957
1860	305,208	202,810	457,343	9,108,458	7,568,008
1861	518,300	250,256	674,474	15,930,706	13,300,495
1862	529,600	221,729	711,405	15,630,595	14,915,680
1863	453,424	185,813	603,526	13,485,419	12,837,620
1864	295,225	187,339	414,833	9,147,274	8,992,479
1865	389,771	212,829	467,576	12,043,659	10,479,777
1866	495,901	328,730	720,366	12,777,557	11,634,749
1867	502,252	546,000	921,663	12,523,464	9,598,452
1868	567,358	624,930	1,017,598	12,750,578	9,878,090
1869	807,763	481,511	1,220,058	17,745,238	14,272,799
1870	824,799	520,049	1,225,941	18,883,837	16,127,838
1871	796,782	567,893	1,211,427	15,686,611	13,409,467
1872	834,202	560,206	1,235,001	13,618,959	11,570,575
1873	1,254,821	634,102	1,805,200	28,457,937	24,994,266

Corn and oats.—The receipts and shipments of corn and oats for fifteen years were as follows:

Years.	CORN.		OATS.	
	Receipts.	Shipments.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1859	155, 341	41, 364	360, 912	299, 002
1860	126, 404	37, 203	178, 963	64, 682
1861	114, 931	1, 485	151, 346	1, 200
1862	258, 954	9, 089	282, 756	70, 094
1863	358, 450	88, 989	948, 429	831, 600
1864	460, 575	164, 786	1, 055, 844	801, 494
1865	270, 754	71, 203	667, 492	326, 422
1866	789, 080	480, 408	1, 817, 230	1, 636, 695
1867	692, 684	266, 249	1, 156, 319	622, 469
1868	620, 728	342, 717	994, 784	536, 539
1869	487, 564	93, 808	722, 949	351, 768
1870	435, 318	103, 173	638, 098	210, 187
1871	1, 151, 382	419, 133	1, 121, 950	772, 929
1872	2, 140, 178	1, 601, 412	1, 597, 726	1, 338, 028
1873	921, 391	197, 920	1, 602, 129	990, 525

Rye and barley.—The receipts and shipments of rye and barley for fifteen years were as follows:

Years.	RYE.		BARLEY.	
	Receipts.	Shipments.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1859	32, 793	11, 577	123, 984	53, 216
1860	32, 382	9, 735	159, 795	28, 056
1861	73, 448	29, 810	66, 991	5, 220
1862	154, 476	126, 301	149, 997	44, 900
1863	152, 882	84, 047	199, 469	133, 447
1864	88, 541	....	198, 325	23, 479
1865	134, 360	51, 444	149, 443	29, 597
1866	383, 030	255, 329	152, 696	18, 988
1867	237, 303	106, 795	192, 007	30, 822
1868	210, 923	95, 036	244, 932	91, 443
1869	203, 804	120, 662	247, 409	78, 035
1870	190, 593	62, 494	585, 971	469, 325
1871	466, 341	208, 896	874, 070	576, 053
1872	409, 573	209, 751	1, 523, 078	938, 725
1873	376, 634	255, 928	1, 209, 474	688, 455

Total cereals.—The receipts and shipments of all grains (flour reduced to wheat,) during fifteen years were as follows:

Years.	FLOUR AND WHEAT.		FLOUR AND ALL GRAINS.	
	Receipts.	Shipments.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1859	6, 778, 441	6, 147, 737	7, 452, 411	6, 552, 896
1860	10, 634, 498	9, 854, 323	11, 132, 042	9, 993, 999
1861	18, 522, 206	16, 672, 865	18, 928, 922	16, 710, 580
1862	17, 878, 595	18, 472, 705	18, 724, 478	18, 732, 089
1863	15, 752, 639	15, 255, 250	17, 411, 869	16, 903, 333
1864	10, 623, 409	11, 066, 644	12, 426, 694	12, 056, 403
1865	13, 992, 514	12, 817, 657	15, 214, 563	13, 296, 323
1866	15, 257, 062	15, 236, 579	18, 399, 098	17, 627, 989
1867	15, 037, 724	14, 206, 767	17, 313, 037	15, 313, 102
1868	15, 587, 368	14, 966, 080	17, 658, 735	16, 031, 815
1869	21, 784, 053	20, 373, 089	23, 446, 869	21, 017, 362
1870	23, 007, 812	22, 257, 543	24, 857, 792	23, 102, 722
1871	19, 671, 521	19, 460, 602	22, 997, 165	21, 336, 885
1872	17, 789, 969	17, 745, 580	23, 460, 524	21, 833, 496
1873	34, 732, 042	34, 020, 266	38, 841, 670	36, 153, 094

SAINT LOUIS.

The total receipts of grain at Saint Louis during 1873 were 3,651,754 bushels less than in 1872. It is noticeable that a very small proportion of the wheat received at this market is shipped in its raw state. Saint Louis is the greatest center of flour manufacture in the world, the city mills turning out nearly a million and a half of barrels per annum. Saint Louis flour commands the highest prices in the eastern markets. The shipments of flour from this point nearly equal the entire foreign export of the country. A large and increasing manufacture and shipment of corn-meal is also noted during the last five years. The shipments of flour southward by river and rail in 1873 amounted to 1,589,123 barrels, while the eastward shipments were 894,712 barrels, and all others 22,380 barrels.

Flour and wheat.—The receipts, manufactures, and shipments of flour and wheat during nine calendar years were as follows:

Years.	Flour.			Wheat.		Total wheat.*	
	Receipts.	Manufactures.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Barrels.	*Barrels.*	*Barrels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1865	1, 161, 038	743, 281	1, 191, 465	3, 452, 722	62, 860	9, 257, 912	7, 670, 185
1866	1, 208, 726	818, 300	1, 700, 740	4, 410, 305	635, 817	10, 453, 935	9, 139, 517
1867	944, 075	765, 298	1, 450, 475	3, 571, 593	321, 888	8, 491, 968	7, 574, 263
1868	805, 836	895, 154	1, 499, 337	4, 353, 591	542, 234	8, 3[illegible]2, 771	8, 038, 839
1869	1, 240, 555	1, 068, 592	2, 172, 761	6, 736, 454	1, 715, 005	12, 789, 429	12, 578, 805
1870	1, 491, 626	1, 351, 773	2, 790, 739	6, 638, 253	634, 562	14, 196, 383	14, 588, 257
1871	1, 428, 408	1, 507, 915	2, 676, 525	7, 311, 910	1, 048, 532	14, 453, 950	14, 431, 157
1872	1, 259, 933	1, 294, 798	2, 247, 040	6, 007, 987	918, 477	12, 307, 652	12, 153, 677
1873	1, 296, 457	1, 420, 287	2, 506, 215	6, 185, 038	1, 210, 286	12, 667, 323	13, 741, 361

* Including flour reduced to wheat-bushels.

In addition to the above the millers and dealers shipped direct from country mills 180,370 barrels of flour in 1867; 245,822 barrels in 1868; 297,860 barrels in 1869; 407,561 barrels in 1870; 364,043 barrels in 1871; 440,631 barrels in 1872; 324,891 barrels in 1873.

Corn, corn-meal, and oats.—The receipts, manufactures, and shipments of corn, corn-meal, and oats for nine calendar years were as follows:

Years.	Corn.		Corn-meal.			Oats.	
	Receipts.	Shipments.	Receipts.	Manufactures.	Shipments.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Barrels.*	*Barrels.*	*Barrels.*	*Bushels.*	*Bushels.*
1865	3, 162, 313	2, 591, 558	....	....	....	4, 173, 229	3, 083, 864
1866	7, 233, 671	6, 759, 199	....	....	....	3, 568, 253	2, 624, 044
1867	5, 155, 430	4, 318, 937	....	....	....	3, 485, 388	2, 244, 756
1868	2, 600, 277	1, 611, 618	....	....	....	3, 259, 132	1, 952, 579
1869	2, 395, 713	1, 298, 863	11, 113	107, 877	106, 667	3, 461, 844	2, 103, 002
1870	4, 708, 838	3, 636, 060	38, 225	165, 231	171, 203	4, 519, 510	3, 144, 744
1871	6, 030, 734	4, 469, 849	38, 003	213, 418	191, 910	4, 358, 099	2, 484, 582
1872	9, 479, 387	8, 029, 739	51, 207	264, 722	234, 938	5, 467, 800	3, 464, 594
1873	7, 701, 787	5, 216, 916	39, 278	422, 534	358, 736	5, 359, 853	3, 215, 206

Rye, barley, and all cereals.—The receipts and shipments of rye, barley, and all grains for nine years were as follows:

Years.	RYE.		BARLEY.		TOTAL CEREALS.*	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1865	217, 568	31, 455	846, 229	50, 090	17, 657, 251	13, 427, 062
1866	375, 417	235, 458	548, 796	89, 751	22, 079, 072	18, 835, 369
1867	250, 704	56, 076	705, 215	55, 720	17, 048, 755	14, 249, 752
1868	367, 961	192, 555	634, 500	64, 426	15, 444, 641	11, 860, 097
1869	266, 056	110, 947	757, 600	57, 134	20, 170, 442	16, 148, 756
1870	210, 542	100, 254	748, 518	70, 451	24, 313, 791	21, 039, 776
1871	374, 336	138, 756	876, 217	62, 843	26, 093, 336	21, 587, 187
1872	377, 587	150, 208	1, 263, 486	87, 566	28, 895, 912	23, 885, 794
1873	356, 580	206, 652	1, 158, 615	125, 604	27, 243, 558	22, 545, 739

* Including flour reduced to wheat-bushels.

SAN FRANCISCO.

Flour and wheat.—The receipts and shipments by sea of flour and wheat for seventeen harvest-years, each closing June 30, were as follows:

Years.	FLOUR.		WHEAT.		TOTAL WHEAT.*	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Barrels.	*Barrels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1857	38, 127	36, 541	566, 716	37, 095	757, 351	219, 800
1858	35, 456	5, 387	405, 086	6, 335	582, 366	33, 270
1859	68, 500	20, 577	721, 670	205	1, 063, 170	103, 080
1860	91, 400	58, 926	1, 641, 710	636, 880	2, 138, 710	931, 510
1861	122, 809	197, 181	3, 607, 200	2, 519, 873	4, 221, 245	3, 535, 778
1862	111, 269	101, 652	2, 419, 110	1, 419, 740	2, 975, 455	1, 928, 000
1863	149, 825	144, 883	3, 151, 295	1, 739, 420	3, 900, 420	2, 461, 835
1864	99, 298	152, 633	3, 073, 066	1, 785, 486	3, 569, 556	1, 548, 651
1865	61, 670	91, 479	848, 605	42, 281	1, 156, 955	500, 676
1866	166, 843	279, 554	3, 570, 653	1, 732, 525	4, 404, 868	3, 130, 295
1867	300, 397	465, 337	8, 697, 560	6, 060, 306	10, 199, 145	8, 386, 991
1868	206, 176	423, 189	8, 401, 990	6, 329, 630	11, 509, 851	8, 515, 625
1869	207, 980	453, 920	10, 568, 971	7, 290, 873	11, 608, 871	9, 560, 473
1870	171, 108	352, 962	10, 941, 776	8, 106, 485	11, 797, 316	9, 871, 295
1871	120, 913	196, 219	7, 967, 690	5, 953, 673	8, 571, 655	6, 934, 168
1872	146, 749	270, 079	3, 908, 350	2, 340, 636	4, 642, 095	3, 691, 031
1873	328, 990	263, 645	18, 580, 830	16, 371, 143	19, 725, 760	17, 488, 371

* Including flour reduced to wheat-bushels.

The receipts and shipments of the first six months of the harvest-year, closing December 31, 1873, were as follows: Flour, receipts, 262,068 barrels; shipments, 328,031; wheat, receipts, 9,614,186 bushels; shipments, 7,844,861 bushels; total wheat and flour reduced to wheat-bushels, receipts, 10,244,526 bushels; shipments, 9,485,016 bushels.

The flour-barrel in the above table contains 200 pounds; wheat is estimated at 60 pounds per bushel. The manufactures by the city mills during the last four calendar years were as follows: 1870, 250,000 barrels; 1871, 240,000 barrels; 1872, 310,000 barrels; 1873, 250,000 barrels. Of the exports of 1873, nearly all the wheat and the largest part of the flour were sent to the United Kingdom. This flour export, however, was an exceptional trade resulting from the failure of European wheat-crops. In the previous years the flour export to the British islands was comparatively small.

Corn, rye, oats, and barley.—The receipts of corn, rye, oats, and barley for eight harvest-years were as follows:

Years.	Corn.	Rye.	Oats.	Barley.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1865–'66	76,071	4,107	891,025	2,080,675
1866–'67	44,285	12,142	910,983	1,605,550
1867–'68	54,821	10,000	936,602	1,462,718
1868–'69	100,800	7,857	790,000	1,303,917
1869–'70	119,100	5,025	883,111	1,573,668
1870–'71	149,107	15,170	881,944	1,585,325
1871–'72	67,678	15,890	1,066,902	1,655,610
1872–'73	214,285	19,642	659,580	2,281,893

Corn and rye are to a very small extent exported, the small supply being required mostly for city consumption. During 1873 the export of oats amounted to 9,541 bushels, against 16,950 bushels in 1872. The exports of barley in 1873 were 434,816 bushels, against 293,588 bushels in 1872 and 20,618 bushels in 1871.

SUGAR.

CONSUMPTION IN THE WHOLE WORLD.

The rapid increase in the production and consumption of sugar in the world is a very significant fact, indicating a remarkable tendency to the equalization of social conditions, and a noticeable advance in civilization and refinement. The nutritive and sanitary properties of this article of diet are annually tested by new circles of society, while older classes of consumers are enlarging their rate of consumption. From the most reliable data attainable it appears that the production of sugar has increased during each decade of the last half-century at least 50 per cent. on an average, the ratio accelerating during later periods. A German statistical journal says that the Anglo-Saxon race, including England, the United States, and the British colonies in different parts of the world, stand at the head of sugar consumers, absorbing 1,142,000 tons per annum, or 41.40 pounds *per capita*. Next, the Latin races of France, Italy, Spain, Belgium, Portugal, and Switzerland require annually but 506,000 tons, or 12.34 pounds *per capita*. The Teutonic race of Germany, Austria, Holland, and Denmark consume 262,000 tons, or 7.30 pounds *per capita*. Finally, the Russian and Ottoman Empires and Greece demand only 125,000 tons, or about 3.30 pounds *per capita*. According to the Food Journal, the consumption *per capita* is greater in the United States than in any other country in the world, the United Kingdom being not far behind.

PRODUCTION IN THE WHOLE WORLD.

The greatest increase in sugar production is shown in the European beet-sugar manufacture. From an aggregate of 452,000 tons in 1863 the product has swollen to about 1,250,000 tons in 1873, an increase of nearly 200 per cent. in ten years. The West Indies have enlarged their product from 750,000 tons to 1,050,000 tons in the same period, or about 40 per cent. The East Indies have increased from 208,000 tons to over 300,000 tons, or 44 per cent. Africa furnishes sugar for export only from Egypt on the north, and Cape Colony on the south. These countries ten years

ago furnished less than 1,700 tons per annum; now they ship about 30,000 tons. In Australia the production is rising into some importance, having increased from about 3,000 tons in 1863 to over 5,000 in 1873. The other countries from which the markets of the civilized world have hitherto drawn supplies show a marked decline in production. South America has reduced her product from 306,000 tons in 1863 to not over 200,000 tons in 1873. The islands of the Indian Ocean, during the same decade, have fallen off from 227,000 tons to less than 160,000 tons. The product of the entire world has been estimated at 1,476,714 tons in 1853; 1,938,322 tons in 1863; 2,954,722 tons in 1872; in 1873 it is known that the yield was very considerably enlarged in most of the sugar-producing countries, probably amounting to 3,100,000 tons.

CONSUMPTION IN THE UNITED STATES.

The consumption of sugar in the United States has increased at a rate greater than that of the increase of population. From scarcely thirty pounds per capita in 1860 the consumption rose in 1870 to over forty pounds of sugar, besides two and one-half gallons of molasses. Of the immense mass of material thus consumed, home production furnished, at the most liberal calculation, less than one-eighth. The following tables will show the proportion in which foreign sugar has supplied the wants of the American people:

FOREIGN SUGAR AND MOLASSES.

Imports for six years.

Years.	Brown sugar.		Refined sugar.		Molasses.	
	Pounds.	Value.	Pounds.	Value.	Gallons.	Value.
1868	1, 135, 236, 568	$51, 694, 817	426, 554	$40, 050	60, 854, 256	$13, 056, 465
1869	1, 298, 591, 717	62, 492, 837	1, 028, 971	70, 045	53, 946, 621	12, 351, 401
1870	1, 105, 420, 184	53, 001, 767	261, 197	13, 764	50, 058, 198	11, 487, 900
1871	1, 346, 595, 787	72, 235, 531	1, 079, 898	72, 348	45, 306, 503	10, 593, 141
1872	1, 426, 517, 943	77, 209, 318	516, 490	41, 047	46, 223, 960	10, 566, 222
1873	1, 533, 297, 065	79, 209, 656	116, 613	9, 816	45, 179, 768	10, 063, 985

Years.	Melada, etc.		Candy and confectionery.		Total value.
	Pounds.	Value.	Pounds.	Value.	
1868	5, 976, 402	$173, 043	42, 015	$10, 388	$64, 929, 713
1869	21, 065, 819	726, 071	48, 694	13, 974	75, 654, 328
1870	38, 054, 241	1, 315, 852	56, 456	14, 629	65, 833, 912
1871	93, 557, 676	3, 599, 223	60, 112	18, 171	86, 518, 414
1872	57, 628, 315	2, 288, 073	85, 440	21, 850	90, 120, 510
1873	128, 121, 064	5, 308, 988	59, 586	14, 189	94, 606, 634

Of the raw sugar and molasses in the above table Cuba furnishes from two-thirds to three-fourths, besides nearly the whole of the melada. Our foreign import of refined sugar is credited principally to Canada, Cuba, and Central America. Of candy and confectionery our largest imports are from China, England, France, and Cuba.

Re-exports.

Years.	Brown sugar.		Refined sugar.		Molasses.	
	Pounds.	Value.	Pounds.	Value.	Gallons.	Value.
1868	15,093,986	$650,903	318,712	$42,946	1,412,044	$307,676
1869	13,506,411	661,176	716,067	97,777	1,861,434	412,295
1870	12,808,276	692,579	193,860	17,272	1,655,320	360,939
1871	3,109,651	167,468	209,989	22,527	483,112	111,260
1872	15,640,343	1,089,785	206,752	21,161	505,903	101,739
1873	21,482,744	1,237,194	633,188	69,106	868,620	179,601

Years.	Melada, etc.		Candy and confectionery.		Total value.
	Pounds.	Value.	Pounds.	Value.	
1868	909,229	$28,986	215	$127	$1,030,028
1869	1,149,186	41,727	254	123	1,213,098
1870	4,302,082	144,948	2,095	306	1,216,044
1871	6,908	219	1,794	536	302,010
1872	49,139	2,164	3,260	1,122	1,215,971
1873	8,035,920	371,428	817	399	1,857,728

Of the raw sugar in the above table nearly the whole is sent to British North America and Belgium; about a third of a million pounds is taken by Mexico. Re-exports of refined sugar are mostly to British America, Mexico, and the West Indies. England takes about two-thirds of the molasses, and her North American colonies nearly a fourth; a considerable quantity is sent to South America. Nearly all the melada export is directed to Canada. The candy and confectionery are sent mostly to England, British North America, and Mexico. The following table shows the excess of imports over re-exports, available for home consumption, in the six years under review:

Years.	Brown sugar.		Refined sugar.		Molasses.	
	Pounds.	Value.	Pounds.	Value.	Gallons.	Value.
1868	1,120,142,582	$51,043,914	107,842	(*)	59,492,212	$12,748,789
1869	1,285,085,306	61,831,661	312,304	(*)	52,985,187	11,939,006
1870	1,192,611,908	52,309,188	67,328	(*)	48,402,878	11,126,961
1871	1,343,486,136	72,068,063	870,609	$49,821	44,823,391	10,481,881
1872	1,409,877,600	76,119,533	309,618	19,886	45,718,057	10,464,483
1873	1,511,813,321	77,972,462	(†)	(†)	44,311,148	9,884,384

Years.	Melada.		Candy and confectionery.		Total value.
	Pounds.	Value.	Pounds.	Value.	
1868	4,977,173	$144,057	41,860	$10,111	$63,099,875
1869	19,916,633	684,344	48,440	13,851	74,441,230
1870	33,752,159	1,170,804	54,361	14,323	64,617,868
1871	93,550,773	3,599,004	58,318	17,635	86,216,404
1872	57,579,176	2,285,909	82,180	20,728	88,910,539
1873	120,185,144	4,937,560	58,969	13,790	92,748,906

* During the first three years represented in the above table the value of the refined sugar re-exported was greater than that of the imports. The excess of re-exports in 1868 was $2,896; in 1869, $27,732; in 1870, $3,508.

† In 1873 the re-exports of refined sugar exceeded the imports both in quantity and value, the excess being 516,575 pounds and $59,290.

The above tables show the amount of foreign cane-sugar and molasses available for consumption during six years. The New York Shipping-List has prepared estimates of the annual consumption for a series of years, by adding the amount undistributed at the ports of entry at the beginning of each year to the imports of that year, and then deducting the re-exports and the amount undistributed at the close. This gives the approximate "consumption," or, more accurately, yearly distribution, of foreign sugar; the consumption of domestic cane-sugar is separately estimated and aggregated with the foreign. The following table shows the estimated consumption of cane-sugar during twenty-four years, and of cane-molasses during twenty-two years, ending with 1873, in the United States, east of the Rocky Mountains:

Years.	FOREIGN.		DOMESTIC.		TOTAL.	
	Sugar.	Molasses.	Sugar.	Molasses.	Sugar.	Molasses.
	Tons.	*Gallons.*	*Tons.*	*Gallons.*	*Tons.*	*Gallons.*
1850	143, 045	....	126, 421	....	269, 466	....
1851	179, 825	....	107, 438	....	287, 263	....
1852	196, 568	29, 417, 511	118, 659	18, 840, 000	315, 217	48, 257, 511
1853	200, 010	28, 576, 821	172, 379	26, 960, 000	372, 989	55, 536, 821
1854	150, 854	24, 437, 019	234, 444	32, 056, 000	385, 298	56, 493, 019
1855	192, 607	23, 583, 423	185, 145	23, 732, 662	377, 752	47, 632, 662
1856	171, 616	23, 014, 878	207, 144	16, 594, 000	378, 760	39, 608, 878
1857	241, 765	23, 266, 404	39, 000	5, 242, 380	280, 765	28, 508, 784
1858	244, 758	24, 795, 374	143, 734	20, 373, 790	388, 492	45, 169, 164
1859	239, 034	28, 293, 210	192, 150	25, 567, 760	431, 184	54, 260, 970
1860	296, 250	28, 724, 205	119, 031	18, 594, 672	415, 281	47, 318, 877
1861	241, 420	20, 383, 556	122, 399	19, 808, 000	363, 819	40, 191, 556
1862	241, 411	25, 650, 400	191, 000	35, 018, 000	432, 411	60, 668, 400
1863	231, 398	26, 569, 088	52, 910	11, 000, 000	284, 308	37, 569, 088
1864	192, 660	28, 582, 325	28, 000	3, 838, 535	220, 660	32, 410, 325
1865	345, 809	34, 535, 038	5, 000	750, 000	350, 809	35, 185, 038
1866	383, 178	43, 840, 110	8, 500	1, 300, 000	391, 678	45, 140, 110
1867	378, 068	46, 776, 465	22, 500	3, 000, 000	400, 568	49, 776, 465
1868	446, 533	52, 587, 969	23, 000	2, 370, 000	469, 533	55, 957, 969
1869	447, 899	47, 961, 092	45, 000	6, 400, 000	492, 899	54, 361, 092
1870	483, 892	42, 723, 171	46, 800	6, 600, 000	530, 692	49, 323, 171
1871	553, 714	41, 165, 784	79, 600	10, 900, 000	633, 314	52, 065, 784
1872	567, 573	42, 995, 203	69, 800	10, 700, 000	637, 373	53, 695, 203
1873	592, 725	41, 985, 526	59, 300	9, 500, 000	652, 025	51, 485, 526

The same authority estimates the consumption for seven years of foreign and domestic sugar, including cane-molasses and sorghum and beet-root sugars, and embracing the Pacific coast, as follows: 1867, 467,268 tons; 1868, 543,033 tons; 1869, 574,399 tons; 1870, 606,492 tons; 1871, 702,314 tons; 1872, 720,873 tons; 1873, 740,525 tons. The consumption of molasses of all kinds has averaged over 100,000,000 gallons per annum for the last three years.

PRODUCTION OF SUGAR IN THE UNITED STATES.

Maple-sugar.—The new settlements in the Northern and Western States have from the beginning drawn a very considerable supply of sugar from the juice of the maple tree, (*Acer saccharinum.*) The immense forests that covered these States in the earlier days of the Republic gave a wide range to this production, but the rapid destruction of timber to make way for cultivation is annually narrowing its limits. The census report of 1870 showed a manufacture of 28,443,645 pounds of maple-sugar and 921,057 gallons of maple-molasses, against 40,120,205 pounds of sugar and 1,597,589 gallons of molasses in 1860; the yield of 1850 embraced 34,253,436 pounds of sugar, the yield of molasses being consolidated with that of cane-molasses. The processes of manufacture

have generally been of a very rude character, inasmuch as the narrowing sources of supply discouraged the investment of capital upon a large and intelligent scale. The yield of the spring of 1874 has been unusually large, probably reaching 40,000,000 pounds of sugar and above a million gallons of molasses.

Sorghum-sugar.—The Chinese sugar-cane (*Sorghum saccharatum*) was introduced into this country from France in 1854, through the agency of the Department of Agriculture, then a branch of the Patent-Office. Another variety of this cane, the *Imphee*, was received in 1857 from Africa. The experimental culture of this new sugar-plant was very satisfactory in many portions of the country, the seeds having been widely distributed by the Department. The census of 1860 shows a manufacture of 6,749,123 gallons of molasses but no sugar. The census of 1870 embraces 16,050,089 gallons of molasses and 28 hogsheads of sugar. These results are very small in comparison with the great public necessities which the sugar interest is expected to supply. Reports from correspondents of this Department do not give any ground for hoping that sorghum will ever be the source of sugar supply, or that even its molasses product will rise to any commanding importance. On the contrary, the industry appears to be declining in some localities where its early prosecution was considered very promising.

Beet-sugar.—Beet-sugar production, as an extensive and remunerative branch of industry, is still an unsolved problem in this country. Several attempts to inaugurate the culture of the beets and to manufacture the sugar have failed. Two enterprises in California, at Alvarado and Sacramento, had a fair measure of success, producing an estimated aggregate of 2,000 tons during 1873. Of these the Alvarado company proposes to remove their establishment to a more eligible locality; the Sacramento company is understood to be well satisfied with its position and results, and to look hopefully to an enlarged and profitable business in the future.

Cane-sugar.—From present indications it appears that if the immense home demand for sugar is to be met to any extent by home production, it must be through the enlargement of cane production in the Gulf States. The relative importance of this local industry has been greatly affected by the late civil war. In 1855, of a consumption of cane-sugar in the United States estimated at 822,000,000 pounds, 382,000,000 were of American growth, and of the latter three-fourths were produced in Louisiana. The annual yields in the latter State gradually enlarged up to to the breaking out of the war, the crop of 1861—459,410 hogsheads—being the largest ever realized. A writer in De Bow's Review of September, 1866, estimates the capital invested in sugar production in Louisiana before the war at $199,120,000, of which $81,950,000 represented the value of 1,292 sugar estates, lands, buildings, machinery, &c.; $12,920,000 the rolling-stock, live-stock, &c.; $117,170,000 the slaves employed, embracing 130,000 men, women, and children of an average value of $750 *per capita*. The net profits of the year are estimated at over $25,000,000, or 12½ per cent., which include interest and wear and tear. The profits of the previous year, however, did not reach over 2.80 per cent., a specimen of the fluctuating character of sugar production in the past.

During the closing years of the war an attempt was made to revive this industry. In 1864 there was a reported product of 6,668 hogsheads. With the restoration of peace and the settlement of political questions the product has gradually increased until Louisiana furnishes from one-tenth to one-eighth of the amount of sugar necessary for home consumption. In 1869 Mr. L. Boucherau commenced the publication of a series

of annual reports of an actual census of sugar production, to replace those of Mr. P. A. Champomier, which had been published annually from 1850 to 1861. These reports give the annual sugar-crops of Louisiana of each year from 1823 to 1872, (excepting 1830, 1831, 1862, and 1863,) as follows:

Years.	Hogsheads.	Years.	Hogsheads.	Years.	Hogsheads.
1823	30,000	1841	90,000	1857	279,697
1824	32,000	1842	140,000	1858	362,296
1825	30,000	1843	100,000	1859	221,840
1826	40,000	1844	200,000	1860	228,758
1827	71,000	1845	186,000	1861	459,410
1828	88,000	1846	140,000	1864	6,668
1829	48,000	1847	240,000	1865	15,000
1832	70,000	1848	220,000	1866	41,000
1833	75,000	1849	247,923	1867	37,647
1834	100,000	1850	211,201	1868	84,256
1835	30,000	1851	236,547	1869	87,090
1836	70,000	1852	321,934	1870	144,881
1837	65,000	1853	439,324	1871	128,461
1838	70,000	1854	346,635	1872	108,520
1839	115,000	1855	231,427	1873	89,498
1840	87,000	1856	73,976		

RESTORATION OF HOME PRODUCTION.

Mr. Boucherau's reports present the successive steps in the restoration of Louisiana sugar culture under new conditions of production. Prominent among the difficulties which beset the planters is the scarcity of capital and labor. The ravages of the war left them seriously impoverished. In 1868 only three-eighths of the labor of 1861 was available on the sugar-estates. The late rural slave population had largely emigrated to the towns and cities, while the women had abandoned field-work entirely. White laborers have since immigrated to some extent, and Chinese coolies have been imported in some localities, yet the lack of labor is seriously felt, especially by parties unaccustomed to an economical use of this costly element of production.

The main difficulty, however, appears to lie in the lack of scientific and economical processes of culture and manufacture; the former careless, wasteful habits still continue, and in many localities seriously cripple production. The cost of cultivation averages about $50 per acre. The range of yield is extraordinary, being from 10,000 to 150,000 pounds per acre of "cane cut for the mill." If a higher average result could be attained by superior management, the cost of raw material for manufacture might be very greatly reduced. A yield of 10,000 pounds per acre furnishes cane for the mill at half a cent per pound, and an increase of yield, though it may be tenfold, costs no more per acre except for increased expense of harvesting.

The juice in the cane is estimated at 90 per cent. of the whole by weight, of which from one-fourth to one-half is extracted by the machinery in use. Planters claim that the enhanced cost of more elaborate processes would absorb the additional product. Mr. Boucherau compares the actual product of the crop of 1871-'72 with the amount of saccharine matter really contained in that crop, assuming the same ratio as in an experiment with 39,975 pounds of cane, the product of one acre, which contained by saccharometer 3,573 pounds of sugar, but gave only 1,100 pounds, or 1 pound of sugar to 36 pounds of cane, which is richer than the average yield. The total product of the State for 1872 was 146,906,219 pounds of sugar, worth, at 8 cents per pound, $11,752,490, and 110,219,538 pounds of molasses, at 3½ cents per pound, $3,857,683.83;

total yield, $15,610,173.83. Deducting for expenses of cultivating 148,841 acres of cane, at $50 per acre, $7,442,050, and for expenses of manufacturing 146,906,219 pounds of sugar, at 4 cents per pound, $5,876,245, and we have a total expense of cultivation and manufacture of $13,318,295, which leaves a net profit of $2,291,878.83. If the entire saccharine element had been utilized, the results would have been as follows: Sugar, 574,361,991 pounds, at 8 cents per pound, $45,948,959.82; molasses, 382,907,994 pounds, at 3½ cents per pound, $13,401,779.79—total gross proceeds, $59,350,739.61. The expense of culture would have been the same, viz, $7,422,050, and the expense of manufacturing, on account of the increased yield, would have been reduced one cent per pound; 574,361,991 pounds of sugar, at 3 cents, amounting to $17,230,859.73, and making the total expense of production $24,672,909.73; this leaves a net profit of $34,667,829.88. Such result is not presented as practicable by present methods, and the diminished cost of manufacture is suggested without sufficient explanation of the means of securing it; yet it is evident that a large percentage of present waste might be utilized by a thoroughly scientific and economic system of manufacture.

The Marquis de Ste. Croix, an intelligent planter of the Island of Martinique, in his "*Fabrication actuelle du Sucre aux Colonies:* Paris, 1843," noticed that a sugar-mill, at six revolutions per minute, extracted but 45 per cent. of the weight of the cane in juice, but when the movement was slackened to two and a half revolutions per minute the product was raised to 70 per cent. This slower movement gives the juice time to escape from the mill before the *bagasse* is released from pressure, when, by its expansion, it acts as a sponge, re-absorbing a portion of the expressed juice. This lower velocity would of course require more than double the time to crush the same amount of cane, a circumstance unduly magnified in its importance by the impatience of the planter and by the morbid haste and hurry which infects the whole plantation at sugar-making.

Mills have been erected in Louisiana provided with extra machinery for passing the *bagasse* through a second series of rolls. In one case where the first pressure brought 100 gallons of juice the second yielded 16. But Mr. Boucherau, in his report of 1871–'72, concludes "that as long as the saccharine matter of the cane is extracted by simple pressure we will never get half the sugar we ought to have. How, then, are we to save this frightful waste? This is the one great question of the day for the sugar interest. Some mode must be devised to accomplish this object and further purpose." He calls upon the inventive genius of the American people to devise a remedy, and intimates that few practical planters have given the subject much consideration.

In his report for 1872–'73 Mr. Boucherau gives some very interesting statistics of Louisiana sugar production, prepared by Mr. M. S. Bringier, from which the following points are evident: The annual average yield of canes on the sugar-plantations should be about 60,000 pounds per acre, containing 90 per cent. or 54,000 pounds of juice. The latter at 8° 5′ Baumé, its average strength, contains 15.3 per cent. of pure, dry sugar, making the average total amount of saccharine matter in an acre of cane 8,262 pounds, or one pound of sugar to about 7.26 pounds of cane. The sugar, on evaporation, absorbs water of crystallization raising the percentage of sugar and molasses to 17.59, in the proportion of three parts of sugar to two of molasses. If there were a perfectly exhaustive process by which the whole saccharine element could be ex-

tracted, the average yield of an acre of cane would be about 5,700 pounds of sugar and 3,800 pounds of molasses. But the planters require from 35 to 55 pounds of cane to make a pound of sugar and two-thirds of a pound of molasses. The average of the State is 2.25 pounds of sugar and 1.5 pounds of molasses to each 100 pounds of cane. At this rate of production an average plantation with 100 acres under cultivation in cane yields 135,000 pounds of sugar, at 8 cents per pound, and 90,000 pounds of molasses, at 4 cents per pound; total, $14,400. The expenses of culture are $5,000; of manufacture, $5,400; taxes, overseer, engineer, &c., $2,000; total $12,400, leaving a net profit of but $2,000. Mr. Bringier thinks it demonstrated that 10.5 pounds of cane will easily yield a pound of sugar and two-thirds of a pound of molasses. At this rate 100 acres of cane averaging 60,000 pounds per acre should yield 571,428 pounds of sugar, at 8 cents per pound, and 380,952 pounds of molasses, at 4 cents per pound; total, $60,951.32. The expenses of cultivation and management would be the same as for the actual crop, but the cost of manufacture would be enhanced, making the total expense $18,951.32, and leaving a net profit of $42,000, or $40,000 more than is now derived from 100 acres of cane on an average. These considerations give some idea of the enormous losses inflicted upon the sugar interest and upon the country by unthrifty methods of production. It is a startling thought that probably a hundred million pounds of sugar are annually burned up in the *bagasse* of imperfectly treated canes.

The average area annually cultivated in sugar-cane in Louisiana does not exceed 150,000 acres, or about half of an ordinary county; yet if even this small acreage could be brought up to the standard which Mr. Bringier, one of the most intelligent planters in Louisiana, thinks is entirely practicable, the annual yield of the State would exceed 855,000,000 pounds of sugar and 52,500,000 gallons of molasses, which would equal one-half our annual import of sugar and exceed our import of molasses. But there is no reason why the sugar-growing area of Louisiana should not be increased fivefold, except what grows out of a lack of capital and enterprise. These elements only await the termination of the present transition-stage of social order and the settlement of political issues based on interests that no longer exist. When production and exchange are accommodated to the new conditions of labor, there is reason to hope that our own cane-sugar area in Louisiana and the other Gulf States will almost entirely supply our home demand for that article.

The sugar-cane has been grown to a limited extent in ten other Southern States. Of these Texas produced the largest amount of crystallized sugar, according to the census reports of 1860 and 1870. In the "Texas Almanac" for 1872 it is stated that the sugar-lands of that State, not being considered as suitable to white labor, have been left mostly uncultivated since the emancipation of the slave laborers. Many of these lands before the war commanded from $20 to $50 per acre; now they will bring not over one-fourth or one-third of that price. Texas probably has as large an area suited to sugar production as Louisiana, if not larger. Florida, stretching nearly down to the tropics, has undeveloped capacities in the same direction. Georgia shows a considerable production. It is remarkable that South Carolina and Tennessee in 1870 showed a greatly increased yield over that of 1860, while Arkansas for the first time reports a sugar production. It is impossible to say how large an area is available for sugar production in these States. The crops of sugar and molasses in eleven Southern States, for the years 1859 and 1869, are reported by the census as follows:

States.	1859.		1869.	
	Sugar.	Molasses.	Sugar.	Molasses.
	Hhds.	*Galls.*	*Hhds.*	*Galls.*
North Carolina	38	12, 494	35	33, 888
South Carolina	198	....	1, 055	436, 882
Georgia	1, 167	546, 749	644	553, 192
Florida	1, 669	436, 357	952	344, 339
Alabama	175	85, 115	31	166, 009
Mississippi	506	10, 016	49	152, 164
Louisiana	221, 726	13, 439, 772	80, 706	4, 585, 150
Texas	5, 099	408, 358	2, 020	246, 062
Arkansas	....	....	92	72, 008
Missouri	402	22, 305	49	....
Tennessee	2	2, 830	1, 410	3, 623
Total	230, 982	14, 963, 996	87, 043	6, 593, 323

EXPORTS OF DOMESTIC SUGAR.

The exports of domestic sugar and molasses during six calendar years were as follows:

Year.	BROWN SUGAR.		REFINED SUGAR.		MOLASSES.		CANDY, ETC.		Total value.
	Pounds.	Value.	Pounds.	Value.	Gallons.	Value.	Pounds.	Value.	
1868	3, 010	$400	2, 640, 379	$400, 693	285, 706	$141, 642	23, 963	$7, 078	$549, 822
1869	16, 979	2, 146	2, 304, 164	339, 967	28, 762	16, 297	8, 378	11, 114	370, 524
1870	50, 968	3, 214	4, 540, 383	544, 079	1, 078, 025	295, 413	....	14, 804	857, 510
1871	12, 744	1, 601	4, 969, 963	654, 367	3, 289, 370	781, 247	....	22, 977	1, 460, 192
1872	75, 428	7, 548	6, 909, 183	839, 316	3, 268, 135	647, 199	....	25, 845	1, 519, 906
1873	235, 048	21, 457	9, 854, 070	1, 044, 794	3, 184, 149	691, 159	....	29, 261	1, 786, 672

The above table shows an increasing appreciation of American sugar in foreign countries. It will be seen on comparison with a previous table that our exports of native refined sugar in 1873 were nearly eighty-five times as great as our imports of foreign refined sugar and nearly sixteen times as great as our re-exports of the same. Our total exports of native sugar and molasses nearly equal in value our total re-exports of foreign.

PRICES OF SUGAR IN 1873.

Prices of sugar in American markets uniformly declined in 1873, with the exception of one or two slight reactions toward the close of the year. At one time an improvident reduction of stocks on hand caused the impression of a diminution of original supply, but this was soon rectified by increased importations. An unfortunate occurrence at one time threatened to kindle war between the United States and Spain, which would have closed up Cuba and Porto Rico as sources of supply. The steamer Virginius, sailing under the American flag, was captured by a Spanish cruiser and nearly all of her officers and crew summarily executed as pirates. The difficulty, however, was settled by diplomacy, and the ground of hostilities having been removed the course of prices resumed its former direction.

The maximum rates were in January and the minimum in November. Fair to good refining Cuba averaged 92 cents per cental lower than during 1872; refining grades of Porto Rico declined 98 cents per cental;

white Havana, $1.59; Manila, 52 cents. The average premium on gold was a little higher during 1873 than during the previous year.

The average prices of molasses showed a very considerable advance upon the rates of 1872. This rise is specially noticeable in Louisiana molasses, and averaged 8¼ cents per gallon. Foreign molasses also advanced; Porto Rico was nearly 6 cents higher than in 1872; Cuba Muscovado, about 1 cent; Barbadoes and clayed Cuba, about 25 cents per hundred gallons. New Orleans and Porto Rico reached their highest point in September; Cuba Muscovado and clayed Cuba in April, and Barbadoes in May. All kinds were lower in December than in any previous part of the year.

New York still continues to be the great emporium of the sugar trade, receiving 376,569 tons, or 59 per cent. of the total foreign import of 636,497 tons received during 1873; Boston received 83,987 tons; Philadelphia, 53,294 tons; Baltimore, 89,597 tons; New Orleans, 16,238 tons; other ports, 16,812 tons. The import of the whole country for 1872 amounted to 561,002 tons; of which 330,496 tons, or 59 per cent., were received at New York; 76,845 tons at Boston; 39,484 tons at Philadelphia; 83,610 tons at Baltimore; 16,908 tons at New Orleans; 13,659 tons at other ports.

Of the total receipt of foreign molasses, amounting in 1873 to 41,922,680 gallons, New York received 13,107,655 gallons, or less than a third; Boston received 5,586,723 gallons; Portland, Me., 2,889,078 gallons; New Haven, 1,100,465 gallons; Philadelphia, 13,777,925 gallons; Baltimore, 3,728,614 gallons; New Orleans, 700,000 gallons. Philadelphia is the leading point of the import trade, being engaged extensively in refining and manufacturing. During 1872 New York led the import trade, receiving 15,307,318 gallons of a total import of 43,167,398 gallons; Philadelphia received 14,813,780 gallons; Boston, 5,497,700 gallons; Baltimore, 2,792,060 gallons; Portland, 2,309,300 gallons; New Orleans, 821,110 gallons. All the leading ports showed a declining import except Baltimore and Portland. The total import of 1873 was 1,244,718 gallons less than in 1872. The actual consumption of Louisiana molasses is estimated at 1,200,000 gallons less in 1873 than in 1872.

MARKET PRICES OF FARM

The following quotations represent the state of the market,

Products.	January.	February.	March.	April.	May.
NEW YORK.					
Flour, superfine State . bbl	$5 75 to $6 35	$6 40 to $7 15	$5 90 to $6 65	$3 15 to $6 75	$5 75 to $6 35
extra State	6 90 to 7 90	7 35 to 8 65	7 10 to 8 40	7 00 to 8 35	7 00 to 8 25
superfine western	5 75 to 6 35	6 40 to 7 15	5 85 to 6 65	5 90 to 6 65	5 80 to 6 25
extra choice west'n	6 90 to 12 75	7 30 to 13 00	6 75 to 12 75	6 90 to 12 75	7 00 to 12 50
southern shipping, common to choice	6 10 to 8 75	6 50 to 9 00	6 10 to 8 15	6 10 to 8 25	6 00 to 8 25
southern family, ordin'y to choice	8 50 to 12 50	9 00 to 13 25	8 15 to 12 75	8 40 to 12 75	8 15 to 12 50
Wheat, No. 1 spring . bush.	1 70 to 1 72	1 75 to 1 78	1 69 to 1 75	1 75 to 1 80	1 75 to 1 78
No. 2 spring	1 53 to 1 66	1 62 to 1 72½	1 55 to 1 56	1 59 to 1 69	1 52 to 1 67
winter, red, western	1 70 to 1 85	1 90 to 2 00	1 80 to 1 95	1 70 to 1 87½	1 80 to 1 95
winter, amber, western	1 85 to 2 00	2 00 to 2 05	1 85 to 2 00	1 80 to 1 97½	1 95 to 2 05
winter, white, western	1 80 to 2 20	2 00 to 2 35	1 80 to 2 15	1 85 to 2 25	1 95 to 2 35
Rye	93 to 97	85 to 92	90 to 95	88 to ——	98 to 1 00
Barley	92½ to 1 12	90 to 1 30	1 00 to 1 24	1 15 to 1 19	90 to ——
Corn	64 to 69	63½ to 67	61 to 65½	64 to 79	68 to 71½
Oats	44½ to 52½	53 to 57½	48½ to 51½	45½ to 55	49 to 54
Hay . ton.	23 00 to 35 00	23 00 to 34 00	22 00 to 34 00	20 00 to 30 00	23 00 to 28 00
Beef, plain mess . bbl.	4 00 to 12 00	4 00 to 11 75	9 00 to 11 75	9 00 to 11 75	9 00 to 11 75
extra	8 50 to 13 50	8 50 to 13 50	12 00 to 13 50	12 00 to 13 50	12 00 to 13 50
Pork, mess	13 25 to 13 50	14 25 to ——	15 37½ to 15 50	16 50 to 16 75	19 00 to ——
prime	—— to 11 50	11 37½ to ——	—— to 12 00	—— to 13 50	18 00 to ——
prime mess	14 00 to ——	13 87½ to 14 00	14 25 to 14 50	15 75 to 16 75	18 00 to 18 50
Lard . lb.	7⅞ to 8⅛	8 to 8¾	8¼ to 8¾	8¼ to 9¹⁄₁₆	9¼ to 9⅜
Butter, western	11 to 21	15 to 30	18 to 31	18 to 31	32 to 35
State dairy	20 to 40	32 to 45	32 to 48	32 to 48	35 to 39
Cheese, western factory	12½ to 13¾	13½ to 14½	12 to 15	12 to 15	10 to 14½
State factory	12 to 14½	13½ to 16¼	13½ to 17	13½ to 17	12 to 16
Cotton, ordinary to good ordinary	17¾ to 19¾	18¼ to 20⅛	17¼ to 18½	15⅝ to 17½	15 to 16⅞
low middling to good middling	19¾ to 22½	20¼ to 23⅞	19 to 23½	19 to 22¾	18⅜ to 22⅛
Sugar, soft yellow	10 to 11⅛	9¾ to 10⅞	9⅝ to 10½	9⅜ to 10¼	9¾ to 10
soft white	11¼ to 11⅞	11 to 11½	11 to 11⅛	10⅜ to 10⅞	10⅜ to 10½
Tobacco, lugs	9¼ to 10½	9¾ to 10½	—— to 8½	7¼ to 8½	7 to 8½
common to medium leaf	10 to 11½	10½ to 11¼	9 to 10¾	8½ to 10½	8½ to 10½
Wool, American XXX and picklock	....	....	....	....	....
American X and XX	....	....	....	....	....
American Saxony fleece	62½ to 75	65 to 75	63 to 73	63 to 73	48 to 55
American Merino full-blood	60 to 75	65 to 75	63 to 73	63 to 73	48 to 54
combing	60 to 65	65 to 75	63 to 73	63 to 73	58 to 63
pulled	45 to 60	44 to 65	42 to 61	42 to 55	28 to 48
unwashed California spring clip	45 to 50	30 to 45	33 to 40	32 to 39	21 to 31
unwashed California fall clip	30 to 38	25 to 30	20 to 28	22 to 27	19 to 24
Texas	23 to 60	28 to 42	22 to 40	20 to 38	20 to 32
BOSTON.					
Flour, western super . bbl.	5 25 to 6 25	5 75 to 6 25	5 50 to 6 25	5 50 to 6 00	5 50 to 6 00
western extras	6 75 to 10 00	7 00 to 10 00	6 75 to 9 00	6 75 to 9 00	6 75 to 9 00
western choice	9 00 to 12 50	10 00 to 12 75	9 50 to 13 00	9 50 to 12 00	9 50 to 11 50
southern extras	7 00 to 7 50	7 00 to 7 50	7 00 to 7 50	6 75 to 7 25	6 75 to 7 25
Baltimore choice	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00
Wheat . bush.	1 65 to 2 00	1 65 to 2 00	1 65 to 2 00	1 60 to 2 00	1 60 to 2 00
Rye	1 05 to 1 10	1 00 to 1 05	1 00 to 1 05	95 to 1 00	95 to 1 00
Barley	90 to 1 20	90 to 1 20	90 to 1 20	90 to 1 20	90 to 1 20
Corn, southern yellow	74 to 75	73 to 75	77 to 78	72 to ——	73 to 74
western yellow	74 to 75	73 to 75	77 to 78	72 to 73	73 to 74½
Oats	50 to 60	54 to 60	53 to 60	48 to 57	49 to 59
Hay, east'n & west'n . ton.	27 00 to 28 00	20 00 to 28 00	18 00 to 28 00	18 00 to 28 00	16 00 to 28 00
Beef, western mess . bbl.	12 00 to 12 50	12 00 to 12 50	12 00 to 12 50	12 00 to 12 50	12 00 to 12 50
western extra	13 00 to 14 00	13 00 to 14 00	13 00 to 14 00	13 00 to 14 00	13 00 to 14 00
Pork, prime	11 50 to 12 00	11 50 to 12 00	12 00 to 12 50	12 75 to 13 50	15 00 to 15 50
mess	14 00 to 14 50	14 50 to 15 00	15 00 to 15 50	16 25 to 16 50	19 50 to 20 00

PRODUCTS FOR 1873.

as nearly as practicable, at the beginning of each month.

June.	July.	August.	September.	October.	November.	December.
$5 65 to $6 15	$4 70 to $5 10	$4 90 to $5 25	$5 10 to $5 65	$5 15 to $5 85	$5 20 to $5 75	$6 00 to $6 60
6 75 to 8 15	6.05 to 7 00	6 00 to 7 10	6 35 to 7 50	6 35 to 7 25	6 00 to 7 00	6 80 to 7 75
5 60 to 6 10	4 70 to 5 10	4 90 to 5 25	5 10 to 5 65	5 15 to 5 85	5 20 to 5 75	6 00 to 6 60
6 50 to 10 30	5 70 to 10 50	5 85 to 10 75	6 30 to 10 75	6 30 to 10 50	6 00 to 10 75	6 75 to 11 00
6 25 to 8 10	6 00 to 7 75	6 25 to 7 85	6 65 to 7 85	6 65 to 7 35	6 20 to 6 95	7 05 to 8 00
8 25 to 11 50	7 75 to 10 45	7 90 to 10 75	7 85 to 10 75	7 40 to 10 75	7 00 to 11 00	8 05 to 11 00
1 66 to 1 69	1 52 to 1 55	1 46 to 1 47	1 62 to 1 64	1 48 to 1 50	1 40 to 1 44	1 59 to 1 61½
1 55 to 1 61	1 46 to 1 52	1 41 to 1 42	1 53 to 1 59	1 40 to 1 45	1 34 to 1 40	1 50 to 1 56
1 70 to 1 95	1 50 to 1 60	1 50 to ——	1 58 to 1 68	1 58 to 1 61	1 41 to 1 50	1 58 to 1 65
1 70 to 1 95	1 60 to 1 65	1 57 to 1 62	1 68 to 1 73	1 62 to 1 63	1 51 to 1 55	1 65 to 1 68
1 90 to 2 10	1 60 to 1 85	1 50 to 1 80	1 65 to 1 85	1 62 to 1 78	1 45 to 1 70	1 70 to 1 85
96½ to 97	81 to 85	80 to ——	95 to ——	89 to ——	88 to 95	1 00 to 1 15
—— to 1 10	nominal	....	....	1 40 to ——	1 00 to 1 30	—— to 1 50
61 to 67	45 to 68	48 to 58	52 to 68	62½ to 68	60 to 62	74 to 77½
48 to 58½	43½ to 46	41 to 52	43 to 47¾	50 to 57½	45 to 49	55 to 59
22 00 to 28 00	23 00 to 30 00	28 00 to 34 00	20 00 to 31 00	22 00 to 28 00	22 00 to 28 00	19 00 to 28 00
9 00 to 11 50	9 00 to 11 50	9 00 to 10 50	9 00 to 10 50	8 50 to 10 00	8 50 to 10 00	8 50 to 10 50
11 25 to 13 50	11 25 to 12 50	11 25 to 12 50	11 25 to 12 50	10 00 to 12 00	10 00 to 12 00	11 50 to 12 50
16 37½ to ——	16 20 to ——	17 50 to ——	17 50 to 17 70	17 00 to ——	14 90 to 15 00	15 00 to ——
14 00 to ——	13 50 to 13 75	15 00 to 15 25	15 00 to 15 12½	14 75 to ——	13 90	12 25 to 13 00
17 00 to 17 50	15 62½ to 16 12½	....	16 50 to 17 50	15 75 to 16 50	15 50 to 16 00	14 75 to ——
8⅛ to 9 1/16	8⅞ to ——	8⅜ to 8¾	8⅜ to 9	8⅜ to 8⅝	7⅛ to 7¾	8¼ to 8¾
18 to 24	15 to 23	13 to 25	14 to 25	17 to 31	18 to 31	18 to 25
24 to 29	23 to 28½	25 to 33	25 to 33	26 to 37	25 to 38	28 to 38
11 to 14	9 to 10	10¼ to 13¾	10 to 12½	11½ to 12	13 to 14	9¼ to 13¼
12 to 15½	12 to 12¾	13 to 14	12 to 13	12½ to 13½	....	11½ to 13¾
14¼ to 16½	14¼ to 18	14¼ to 17⅞	14 to 17⅛	14⅞ to 17⅛	13⅛ to 14⅛	13⅞ to 15¼
18¼ to 22	20 to 23	19⅝ to 22¾	19 to 22	17¾ to 20⅛	14⅜ to 16⅝	15⅜ to 17¼
9 to 9⅞	8½ to 9½	9 to 10⅜	9⅜ to 10½	9⅜ to 10⅞	8½ to 9⅝	8¼ to 9⅛
10 to 10⅜	9¾ to 10½	10¼ to 10⅝	10⅝ to 11⅛	10⅜ to 10¾	9½ to 9⅞	9¼ to 9⅜
7 to 8½	7 to 8½	7 to 8½	7 to 8½	7 to 7¾	6¼ to 7¼	7 to 8¼
8½ to 10¼	8½ to 10½	8½ to 10½	8½ to 10½	7¾ to 8¼	8 to 10	9¾ to 11
....	....	....	....	58 to 62½	58 to 62½	50 to 56
....	....	....	....	48 to 55	49 to 52	42 to 50
48 to 55	50 to 53	50 to 53	50 to 53	....	....	....
43 to 54	48 to 50	48 to 50	48 to 50	....	....	....
58 to 63	50 to 55	55 to 60	55 to 60	57 to 63	57 to 63	52 to 55
28 to 56	30 to 47	30 to 47	30 to 47	28 to 46	27 to 40	27 to 45
20 to 31	21 to 31	18 to 31	18 to 31	25 to 35	25 to 35	18 to 33½
17 to 24	17 to 22	16 to 22	16 to 23	19 to 25	20 to 27	19 to 27
17 to 32	18 to 33	16 to 33	16 to 33	18 to 35	18 to 35	18 to 33
5 50 to 6 25	5 00 to 5 50	4 50 to 5 50	5 00 to 5 50	5 00 to 5 50	5 00 to 5 50	5 50 to 6 00
6 75 to 9 00	6 25 to 7 50	6 00 to 9 00	6 25 to 9 00	6 25 to 9 00	5 75 to 7 50	6 75 to 8 00
9 50 to 12 00	8 00 to 11 00	9 00 to 11 00	9 00 to 10 75	9 00 to 11 25	8 00 to 11 00	8 50 to 11 00
7 00 to 7 50	6 50 to 7 00	6 00 to 6 50	6 25 to 6 75	6 25 to 7 00	6 00 to 6 50	6 75 to 7 25
10 00 to 12 00	9 00 to 11 00	9 00 to 11 00	9 00 to 11 00	9 00 to 11 00	9 00 to 11 00	9 00 to 11 00
1 60 to 2 00	1 50 to 1 90	1 45 to 1 80	1 45 to 1 80	1 50 to 1 85	1 60 to 1 85	1 50 to 1 85
1 00 to 1 05	85 to 90	80 to 85	95 to ——	1 00 to 1 50	95 to 1 00	95 to 1 00
90 to 1 20	90 to 1 20	90 to 1 20	....	....	1 30 to 1 70	1 30 to 1 80
70 to 71	60 to 62	64 to 66	71 to 72	74 to 75	68½ to 69	82 to ——
70 to 71	60 to 62	64 to 66	71 to 72	74 to 75	68½ to 69	82 to ——
48 to 50	40 to 51	43 to 55	43 to 57	50 to 57	49 to 55	53 to 59
15 00 to 23 00	18 00 to 20 00	13 00 to 30 00	18 00 to 30 00	18 00 to 27 00	18 00 to 26 00	16 00 to 26 00
12 00 to 12 50	10 50 to 12 50	10 50 to 12 50	10 50 to 12 50	10 50 to 12 50	8 00 to 11 50	8 00 to 12 00
12 00 to 12 50	12 50 to 13 50	12 50 to 13 50	12 50 to 13 50	12 50 to 13 50	11 50 to 12 50	12 00 to 13 00
14 00 to 14 50	13 75 to 14 25	14 00 to 15 00	15 00 to 15 50	15 00 to 15 50	14 50 to 15 00	12 50 to 13 00
17 00 to 18 00	16 50 to 17 00	17 00 to 18 00	18 00 to 18 50	13 00 to 18 50	15 75 to 16 00	14 75 to 15 00

MARKET PRICES OF FARM

The following quotations represent the state of the market,

Products.	January.	February.	March.	April.	May.
BOSTON—Continued.					
Lard.................lb.	$0 8¼ to $0 9	$0 8½ to $0 9¼	$0 8½ to $0 9¼	$0 8¾ to $0 9½	$0 9¾ to $0 10½
Butter, New York and Vermont.......	15 to 34	18 to 37	18 to 38	20 to 40	35 to 40
western..........	12 to 30	15 to 30	15 to 32	18 to 32	35 to 38
Cheese, New York and Vermont factory........	12 to 14½	13 to 16½	13 to 17	12 to 17	11 to 16
New York and Vermont dairy.	11 to 13½	12 to 15½	12 to 16½	11 to 16	10 to 15
western factory, good to choice.	12 to 14½	13 to 16	13 to 16½	13 to 16	12 to 15½
Cotton, ordinary to good ordinary.......	17¾ to 20	18¼ to 20¼	17 to 19	14 to 17¾	13½ to 17½
low middling to good middling.	20 to 26	20¼ to 25	19½ to 24	19 to 22½	18½ to 22
Sugar, fair to good refining.............	9 to 9¾	8¾ to 9½	8½ to 8¾	8 to 8¼	7⅞ to 8½
Tobacco, lugs............	10 to 10½	10 to 10½	10 to 10½	8½ to 10	8½ to 10
common to medium leaf....	11 to 12	11 to 12	11 to 12	9½ to 10½	9½ to 10½
Wool, Ohio and Pennsylvania..........	63 to 75	62 to 70	56 to 64	50 to 62	45 to 58
Michigan.........	62 to 66	60 to 66	55 to 60	50 to 55	42 to 50
other western.....	60 to 65	59 to 64	55 to 59	48 to 55	40 to 49
pulled.............	40 to 75	35 to 70	25 to 70	20 to 55	20 to 50
combing fleece....	70 to 75	70 to 75	65 to 70	60 to 65	60 to 65
California.........	23 to 50	23 to 50	20 to 27	18 to 35	18 to 35
Texas.............	45 to 55	45 to 55	25 to 35	18 to 30	18 to 30
PHILADELPHIA.					
Flour, superfine, per bbl.	4 50 to 5 50	4 50 to 5 25	5 00 to ——	5 00 to 5 50	5 75 to 6 35
Pa. extra..........	5 75 to 6 50	6 25 to 7 00	6 25 to 6 75	7 25 to ——	7 00 to 8 25
Pa. family........	7 50 to 9 00	8 50 to 9 25	8 50 to 8 75	8 00 to 9 00	5 80 to 6 25
western family...	7 50 to 8 50	7 87½ to 9 00	7 50 to 9 50	7 50 to 8 25	8 00 to 8 75
western fancy....	8 75 to 10 50	9 00 to 11 50	10 00 to 11 50	8 37½ to 12 00	8 50 to 10 50
Wheat, red, per bushel...	1 88 to 1 95	1 90 to 1 97	1 88 to 1 97	1 82 to 1 95	1 92 to 2 00
amber............	1 85 to 1 98	2 00 to 2 05	1 97 to 1 98	1 95 to 2 00	1 97 to 2 05
white............	1 95 to 2 05	2 05 to 2 15	2 05 to 2 10	1 90 to 2 12	2 00 to 2 16
spring............	1 60 to 1 85	1 60 to 1 75	1 62 to 1 75	1 68 to 1 95	1 58 to 1 97
Rye.....................	92 to ——	87 to ——	85 to 88	82 to 83	95 to ——
Barley..................	85 to 95	90 to 1 05	82 to 1 25	90 to 1 22	—— to 1 20
Corn....................	60 to 66	58 to 68	58 to 63	59 to 65	62 to 66
Oats....................	44 to 51	46 to 52	46 to 50	46 to 50	47 to 52
Hay, fresh baled.......ton	38 00 to 42 00	30 00 to 36 00	27 00 to 30 00	24 00 to 30 00	30 00 to 35 00
common & fair shipping............ton	36 00 to 38 00	30 00 to 32 00	25 00 to 27 00	20 00 to 24 00	25 00 to 30 00
Pork, mess ....bbl	13 00 to 13 75	15 00 to 15 50	13 75 to 15 25	17 00 to 17 25	19 00 to 19 50
prime mess........	12 00 to ——	12 00 to 13 50	13 00 to 13 25	14 00 to ——	....
prime.............	....	....	....	....	15 25 to 15 50
Beef, western mess.......	8 00 to 10 00	8 00 to 10 00	8 00 to 10 00	8 00 to 10 00	8 00 to 10 00
extra mess.........	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00
Warthman's city family............	15 00 to ——	16 00 to ——	16 00 to ——	16 00 to ——	16 00 to ——
Lard.....................lb	7½ to 11¼	7¾ to 11¼	8 to 11¼	8¾ to 11½	9½ to 12
Butter, choice............	32 to 36	32 to 40	28 to 40	35 to 45	37 to 38
good............	25 to 32	26 to 30	25 to 28	28 to 35	30 to 35
Cheese, N. Y. factory....	14 to 15	15 to 16½	16 to 17	16 to 17	14½ to 15¼
Ohio factory.....	13 to 13¾	15 to 15½	15 to 16	15 to 16	11 to 13
Sugar, fair to good refining..........lb	—— to 9⅛	9 to 9⅛	8½ to 8⅞	8⅛ to 8⅝	7¾ to 8
Cotton, ordinary to good ordinary.......lb	16½ to 19¼	18½ to 20½	18½ to 19	15 to 19	14¾ to 17¾
low middling to good middling. lb	19¾ to 21½	20½ to 23	19½ to 22½	18¾ to 21	18¼ to 21½
Wool, Ohio X and XX....	67 to 70	66 to 69	62 to 63	50 to 55	51½ to 52
combing...........	62½ to 75	78½ to 80	78 to 80	60 to 76	65 to 67½
tub washed.......	68 to 75	65 to 75	62 to 68	55 to 62	46 to 52½
unwashed.........	43 to 47½	25 to 58	23 to 60	25 to 52½	42 to 50
pulled............	52½ to 60	50 to 57	50 to 52	45 to 55	42 to 50
BALTIMORE.					
Flour, superfine......bbl.	5 00 to 8 50	5 50 to 9 00	5 00 to 8 50	5 00 to 8 50	5 00 to 8 00
extra.............	6 65 to 10 00	7 00 to 10 50	6 75 to 10 50	6 50 to 9 75	6 25 to 9 75
family and fancy..	8 25 to 12 00	8 50 to 12 50	8 50 to 12 00	8 25 to 12 00	8 00 to 11 50

PRODUCTS FOR 1873.

as nearly as practicable, at the beginning of each month.

June.	July.	August.	September.	October.	November.	December.
$0 9¼ to $0 9¾	$0 8½ to $0 9¼	$0 8¾ to $0 9¼	$0 8¾ to $0 9½	$0 8¾ to $0 9½	$0 8½ to $0 9	$0 8¼ to $0 9
23 to 29	22 to 27	23 to 28	22 to 32	25 to 36	20 to 38	25 to 37
25 to 27	20 to 25	20 to 25	18 to 26	22 to 30	22 to 30	22 to 32
10 to 14½	12½ to 13	11½ to 13	11½ to 13½	13 to 13½	14 to 14½	11 to 14
....	....	10 to 10½	10 to 12½	10 to 13	11 to 14	....
12 to 14	12 to 12½	12½ to 13	12½ to 13	12½ to 13	13½ to 14	13 to 13½
12 to 17	13 to 18	13 to 17½	13 to 17	14 to 17½	13 to 14½	14 to 15½
18½ to 22	19½ to 20	19 to 22½	18¾ to 22	17¾ to 20	14½ to 16½	15¾ to 18
7¾ to 8	7⅞ to 7⅞	7⅞ to 8½	8⅛ to 8⅜	7⅞ to 8⅜	7⅞ to 7⅝	7¼ to 7½
7½ to 9	7½ to 9	7½ to 9	7½ to 9	7½ to 9	7½ to 9	7½ to 9
9 to 10½	9 to 10½	9 to 10½	9 to 10½	9 to 10½	9 to 10½	9 to 10½
45 to 60	45 to 58	43 to 45	45 to 58	46 to 65	45 to 58	42 to 55
42 to 50	42 to 50	40 to 48	43 to 50	43 to 51	42 to 48	40 to 47
40 to 49	40 to 49	40 to 48	42 to 48	42 to 49	42 to 48	40 to 46
20 to 55	15 to 55	15 to 55	15 to 55	25 to 56	20 to 50	20 to 50
60 to 65	55 to 60	52 to 57	56 to 60	57 to 62½	52 to 58	50 to 55
17 to 35	17 to 35	17 to 35	17 to 35	17 to 35	15 to 35	15 to 35
18 to 30	18 to 30	18 to 30	18 to 30	18 to 30	18 to 30	18 to 30
4 75 to 5 50	3 50 to 4 25	3 50 to 4 25	3 50 to 4 25	4 00 to 4 50	4 25 to 5 25	4 50 to 4 75
5 75 to 6 50	4 75 to 5 00	4 00 to 5 00	4 62½ to 5 25	4 00 to 5 50	5 25 to 5 75	6 00 to 6 25
7 87½ to 8 75	7 00 to 8 00	7 25 to 8 25	7 25 to 8 00	6 75 to 8 25	7 50 to 8 00	7 25 to 8 25
8 00 to 8 75	6 25 to 7 00	6 50 to 8 50	7 50 to 8 25	7 00 to 8 50	7 25 to 8 75	5 50 to 7 25
8 50 to 10 50	7 50 to 10 50	9 00 to 10 00	8 00 to 9 50	8 50 to 10 50	9 00 to 10 00	7 50 to 9 00
1 88 to 1 97	1 55 to 1 60	1 40 to 1 55	1 60 to 1 65	1 50 to 1 60	1 45 to 1 56	1 37 to 1 67
1 95 to 2 08	1 59 to 1 65	1 50 to 1 60	1 63 to 1 70	1 60 to 1 68	1 55 to 1 68	1 65 to 1 70
2 10 to 2 15	1 60 to 1 72½	1 65 to 1 85	1 70 to 1 85	1 65 to 1 80	1 75 to 1 88	1 73 to 1 80
1 60 to 1 85	1 35 to 1 52	1 38 to 1 50	1 60 to 1 75	1 40 to 1 45	1 20 to 1 50	1 40 to 1 60
87 to 88	63 to 65	75 to 78	82 to 85	88 to 90	85 to 86	83 to 85
nominal.	nominal.	1 10 to 1 40	1 05 to 1 25	1 45 to 1 50	1 40 to 1 57	1 05 to 1 25
64½ to 67	52 to 56	58 to 60	66 to ——	63 to 68	62 to 63	58 to 75½
45 to 51½	39 to 47	41½ to 52	39 to 48	43 to 51	47 to 50	50 to 55
30 00 to 35 00	25 00 to 28 00	28 00 to 32 00	26 00 to 28 00	26 00 to 28 00	24 00 to 28 00	24 00 to 26 00
25 00 to 30 00	20 00 to 25 00	22 00 to 28 00	20 00 to 22 00	20 00 to 22 00	20 00 to 22 00	20 00 to 22 00
18 00 to 18 37½	17 00 to 17 50	17 50 to 17 75	17 50 to 17 75	17 00 to 17 25	16 00 to ——	15 50 to 15 75
....	16 00 to 16 50	16 00 to 16 50	16 00 to 16 50	14 00 to ——	14 50 to ——	14 50 to ——
17 00 to 17 25	14 50 to ——	14 50 to ——	14 50 to ——	15 50 to ——	13 00 to ——	12 50 to ——
8 00 to 10 00	8 00 to 10 00	8 00 to 10 00	8 00 to 10 00	8 00 to 10 00	8 00 to 10 00	8 00 to 10 00
10 00 to 12 00	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00	9 00 to 12 00	9 00 to 12 00
16 00 to ——	15 00 to ——	15 00 to 15 50	15 50 to ——	15 00 to ——	15 00 to ——	15 00 to ——
9¼ to 12	8¾ to 11½	8½ to 11½	8½ to 11½	8⅜ to 11½	7½ to 11	8⅛ to 11
26 to 28	26 to 30	26 to 30	30 to 33	33 to 36	33 to 36	33 to 36
22 to 25	20 to 26	20 to 26	22 to 35	25 to 30	25 to 30	25 to 30
15 to 15½	13 to 14	13 to 14	13 to 14	13 to 14½	14½ to 15	13¾ to 15
15 to ——	12 to 13	12 to 12½	13 to 13½	13 to 14½	14 to 14½	13 to 13½
7¾ to 8⅜	7¾ to 8	7¾ to 8½	8⅛ to 8½	7⅞ to 8	7 to 7½	7¼ to 7½
14 to 17	14¼ to 18	13¾ to 17½	14¾ to 18½	14 to 17½	11½ to 14	13¾ to 14½
17 to 21½	19 to 23	20 to 22½	18 to 23	17⅜ to 20	14¼ to 17	15½ to 17
51 to 53	47½ to 50	48 to 52	50 to 52	50 to 52	50 to ——	48 to 50
63 to ——	56½ to 63	58 to 65	58 to 63	55 to 65	57 to 60	57 to 58
50 to 52½	50 to 56	48 to 54	50 to 55	50 to ——	51 to 55½	45 to 54
40 to 42	26 to 42	22½ to 45	30 to 32½	33 to 42	27 to 40	32 to 39
42 to 45	40 to 50	28 to 45	40 to 45	40 to 42	42½ to ——	39 to 40
5 00 to 8 00	4 50 to 8 50	4 50 to 8 50	4 50 to 5 50	5 00 to 8 25	4 50 to 5 00	4 50 to 5 50
6 50 to 9 75	6 00 to 9 25	6 00 to 8 50	6 00 to 8 75	6 00 to 8 50	5 50 to 7 75	5 50 to 8 75
8 25 to 11 50	7 50 to 11 00	7 25 to 10 50	7 25 to 10 50	7 25 to 11 00	6 75 to 10 50	7 25 to 10 75

MARKET PRICES OF FARM

The following quotations represent the state of the market,

Products.	January.	February.	March.	April.	May.
BALTIMORE—Cont'd.					
Wheat, white......bush.	$1 85 to $2 25	$2 00 to $2 35	$1 90 to $2 25	$1 85 to $2 10	$1 90 to $2 15
amber..........	1 95 to 2 27	2 05 to 2 35	2 00 to 2 25	1 80 to 2 12	1 95 to 2 15
red..............	1 80 to 2 10	1 78 to 2 20	1 70 to 2 15	1 65 to 2 05	1 80 to 2 05
Rye, common to prime...	90 to 1 00	95 to 1 01	80 to 90	80 to 90	90 to 1 00
Corn, white, southern....	63 to 65	65 to 66	62 to ——	63 to 65	68 to ——
yellow, southern...	62 to 64	60 to 61	58 to 59	60 to ——	64 to ——
mixed, western	62 to ——	61½ to ——	58 to 60	60 to ——	63½ to 64½
Oats, southern..........	48 to 50	46 to 48	46 to 48	46 to 49	53 to 55
western..........	45 to 50	43 to 46	46 to 50	45 to 49	49 to 53
Hay, good to prime western bale......ton.	32 00 to 35 00	28 00 to 33 00	26 00 to 30 00	25 00 to 30 00	26 00 to 30 00
Maryland	....	....	....	30 00 to 37 00	30 00 to 35 00
Beef, Baltimore mess, bbl.	15 00 to 20 00	15 00 to 20 00	15 00 to 20 00	15 00 to 20 00	15 00 to 20 00
extra..............	23 00 to 25 00	23 00 to 25 00	23 00 to 25 00	23 00 to 25 00	23 00 to 25 00
Pork, mess.............	13 50 to 14 00	13 75 to 14 00	14 50 to 14 75	16 50 to 16 75	18 50 to 19 00
Lard..................lb.	7¾ to 8½	8 to 8¼	8 to 8¼	8 to 8⅝	9 to 9¾
Butter, Goshen	30 to 40	30 to 40	30 to 40	38 to 42	35 to 36
Glades...........	20 to 26	20 to 26	20 to 26	....	35 to 36
western..........	20 to 26	18 to 24	22 to 30	28 to 40	28 to 33
Cheese, eastern cutting..	14½ to 15	14½ to 15½	17½ to 18	17 to 18	16 to 17
western cutting..	14 to 14½	16 to 16½	16½ to 17	16½ to 17	14 to 15
Sugar, New Orleans......	8¾ to 10½	8¾ to 10½	8½ to 10	8 to 10	8 to 9½
Cotton, ordinary to good ordinary.......	17 to 18¼	17 to 18½	18 to 18¾	16 to 17½	13 to 16⅜
low middling to middling..........	19½ to 20¼	19½ to 20½	19⅞ to 20⅞	18¼ to 19¼	18½ to 19½
Tobacco, Mary'd..cental.	5 00 to 13 00	5 50 to 13 00	5 50 to 13 00	5 00 to 13 00	4 50 to 13 00
Ohio..........	6 00 to 15 00	7 00 to 15 00	7 00 to 15 00	6 50 to 15 00	6 50 to 15 00
Kentucky	7 00 to 15 00	8 00 to 15 00	8 00 to 15 00	7 50 to 15 00	7 50 to 15 00
Wool, fleece, common to fine.......... lb.	45 to 50	45 to 50	45 to 50	45 to 50	45 to 50
tub	55 to 60	55 to 60	55 to 60	55 to 60	55 to 60
unwashed	35 to 38	35 to 38	35 to 38	35 to 38	35 to 38
pulled.............	35 to 40	35 to 40	35 to 40	35 to 40	35 to 40
CINCINNATI.					
Flour, superfine...per bbl.	5 60 to 6 25	6 00 to 6 75	5 75 to 6 50	5 25 to 5 75	5 25 to 6 00
extra..............	7 50 to 7 75	7 80 to 8 30	7 40 to 7 65	7 00 to 7 35	7 25 to 7 60
family and fancy..	7 75 to 9 25	8 25 to 9 50	7 75 to 9 00	7 40 to 9 00	7 50 to 9 25
Wheat, red winter No. 1, bushel	1 68 to ——	1 78 to 1 80	1 73 to 1 74	1 68 to 1 70	—— to 1 70
red winter, No. 2.	1 62 to 1 64	1 74 to 1 76	1 68 to 1 70	1 60 to 1 65	1 65 to 1 67
hill, (amber)	Nominal.	nominal.	nominal.	nominal.	nominal.
white..............	Nominal.	1 90 to 1 92	1 90 to 1 95	nominal.	nominal.
Rye......................	88 to 93	84 to 90	80 to 84	79 to 80	80 to 83
Barley...................	79 to 93	70 to 95	72 to 83	78 to 90	75 to 1 10
Corn	41 to 42	40 to 42	39 to 40	38 to 40	43 to 47
Oats.....................	29 to 40	32 to 40	33 to 37	31 to 38	41 to 50
Hay, baled, No. 1.....ton.	21 00 to 22 00	20 00 to 21 00	18 00 to 20 00	19 00 to 21 00	19 00 to 20 00
lower grades	17 00 to 19 00	16 00 to 18 00	15 00 to 17 00	15 00 to 18 00	15 00 to 18 00
Beef, plate...........bbl.	13 50 to 14 50	13 00 to 13 50	13 75 to 14 00	14 00 to ——	13 75 to 14 50
Pork, mess.............	11 75 to 12 00	12 75 to 13 00	13 50 to 14 00	16 75 to 17 00	18 00 to 18 75
Lard..................lb.	7 to 7½	7½ to 8	7⅞ to 8½	8⅛ to 8¾	9½ to 9¾
Butter, choice...........	22 to 24	22 to 25	25 to 30	37 to 40	34 to 38
fair, prime.......	15 to 22	16 to 18	18 to 26	28 to 36	25 to 32
Cheese, factory, prime, choice.........	14½ to 15½	14⅞ to 15	15½ to 16	15½ to 16½	13 to 15
pineapple	—— to 25	—— to 25	20 to 23	22 to 23	22 to ——
Cotton, ordinary to good ordinary	16¼ to 17⅞	16¾ to 18¼	15 to 17½	12½ to 15¾	12 to 15⅜
low middling to good middling.	18⅜ to 21	19½ to 21½	18⅜ to 21	17¾ to 20	17½ to 20
Tobacco, lugs, all grades.	8 to 22	8½ to 22	6 to 22	6 to 22	6 to 22
leaf.............	10 to 30	10 to 30	8 to 29½	8 to 29½	8 to 29½
Sugar, New Orleans......	9½ to 11	9½ to 11	9 to 11	9 to 11	8¾ to 10¾
Wool, com. to fine fleece.	50 to 55	50 to 55	48 to 52	45 to 48	35 to 42
tub washed........	60 to 62	60 to 62	55 to 60	48 to 50	40 to 45
unwashed clothing	36 to 38	36 to 38	33 to 35	30 to 32	25 to 30
unwashed combing	45 to 48	45 to 48	45 to 48	40 to 45	35 to 40
pulled...............	45 to 48	45 to 48	40 to 42	35 to 36	33 to 35
CHICAGO.					
Flour, white winter, extras.........bbl.	7 50 to 9 75	7 50 to 10 25	7 90 to 10 50	8 25 to 10 75	8 00 to 10 50
red winter extras..	6 50 to 7 55	6 50 to 7 75	7 00 to 8 00	7 00 to 8 50	7 00 to 8 50
spring extras......	5 50 to 7 25	6 00 to 8 00	6 12½ to 8 00	5 75 to 8 50	6 00 to 8 00
spring superfines..	3 00 to 4 50	3 25 to 5 25	3 50 to 5 80	3 00 to 4 75	2 90 to 4 75

PRODUCTS FOR 1873.

as nearly as practicable, at the beginning of each month.

June.	July.	August.	September.	October.	November.	December.
$1 85 to $2 15	$1 60 to $1 80	$1 60 to $1 75	$1 65 to $1 80	$1 50 to $1 75	$1 50 to $1 70	$1 70 to $1 85
2 00 to 2 10	1 55 to 1 75	1 55 to 1 66	1 60 to 1 78	1 50 to 1 76	1 50 to 1 75	1 65 to 1 85
1 80 to 2 00	1 30 to 1 70	1 45 to 1 63	1 57 to 1 78	1 40 to 1 70	1 30 to 1 62	1 45 to 1 80
90 to 95	70 to 77	60 to 62	75 to 88	80 to 85	80 to 90	80 to 86
71 to 72	76 to 77	86 to 87	68 to 70	68 to 70	78 to 80	70 to 75
62 to 63	60 to ——	58 to 59	59 to 60	64 to 65	65 to 68	66 to 68
63 to ——	60 to 60½	56 to 56½	59½ to 60	65 to ——	65 to ——	67 to 68
51 to 54	45 to 46	40 to 44	45 to 46	43 to 47	50 to 53	46 to 50
48 to 52	42 to 45	40 to 48	43 to 46	44 to 47	48 to 50	45 to 49
26 00 to 30 00	18 00 to 24 00	20 00 to 25 00	20 00 to 25 00	20 00 to 25 00	24 00 to 25 00	20 00 to 22 00
30 00 to 36 00	26 00 to 30 00	30 00 to 33 00	25 00 to 28 00	25 00 to 28 00	25 00 to 27 00	23 00 to 24 00
15 00 to 20 00	15 00 to 20 00	15 00 to 20 00	15 00 to 20 00	15 00 to 20 00	15 00 to 20 00	15 00 to 20 00
23 00 to 25 00	23 00 to 25 00	23 00 to 25 00	23 00 to 25 00	23 00 to 25 00	23 00 to 25 00	23 00 to 25 00
17 75 to 18 00	17 00 to 17 50	17 50 to 17 75	18 00 to 18 25	17 75 to 18 00	15 75 to 16 50	14 75 to 15 00
9 to 9¾	8¾ to 9	8¾ to 9	8¾ to 9	8¾ to 9	7¾ to 8	7¾ to 8
......	......	......	......	22 to 26	24 to 30	24 to 30
20 to 22	14 to 22	14 to 22	15 to 25	20 to 26	25 to 32	25 to 32
15 to 15½	15 to 15½	13½ to 14	14 to 14½	13½ to 14	15 to 15½	14⅛ to 15
13½ to 14½	12½ to 13½	12 to 12½	13½ to 14	13½ to 14	15 to ——	14 to 14½
8 to 9½	8 to 9½	8 to 9½	8 to 9½	7½ to 9½	......	......
13 to 16¼	14 to 17½	14 to 17½	13 to 17	14 to 15½	11¾ to 13½	14½ to 15
18 to 19½	19 to 20¼	19 to 20¼	18 to 19¾	16¾ to 17¾	14 to 14½	15⅛ to 16
4 50 to 13 00	4 50 to 13 00	4 50 to 13 00	4 00 to 13 00	4 00 to 13 00	4 00 to 13 00	3 50 to 13 00
6 50 to 15 00	6 50 to 15 00	6 50 to 15 00	6 50 to 15 00	6 50 to 15 00	6 50 to 15 00	6 50 to 15 00
7 50 to 15 00	7 50 to 15 00	7 50 to 15 00	7 50 to 15 00	7 50 to 15 00	7 50 to 15 00	7 50 to 15 00
45 to 50	45 to 50	45 to 50	45 to 50	45 to 50	45 to 50	45 to 50
55 to 60	55 to 60	55 to 60	55 to 60	55 to 60	55 to 60	55 to 60
35 to 38	35 to 38	35 to 38	35 to 38	35 to 38	35 to 38	35 to 38
35 to 40	35 to 40	35 to 40	35 to 40	35 to 40	35 to 40	35 to 40
5 50 to 6 00	5 00 to 5 25	4 85 to 5 25	4 75 to 5 50	5 00 to 5 50	4 75 to 5 00	4 75 to 5 50
7 15 to 7 60	6 00 to 6 35	5 85 to 6 25	6 50 to 6 85	6 40 to 6 75	6 40 to 6 75	6 35 to 6 75
7 60 to 9 25	6 50 to 8 25	6 25 to 8 00	6 85 to 8 25	6 90 to 8 25	6 75 to 8 25	6 75 to 8 00
1 65 to ——	—— to 1 35	—— to 1 30	1 46 to 1 47	1 30 to 1 35	......	—— to 1 50
1 55 to 1 60	1 30 to 1 32	1 20 to 1 27	1 38 to 1 45	—— to 1 30	1 35 to 1 37	1 45 to ——
1 70 to ——	1 35 to 1 40	1 25 to 1 35	1 45 to 1 50	1 45 to 1 50	1 40 to 1 50	1 40 to 1 55
1 75 to ——	1 45 to 1 50	1 25 to 1 43	1 47 to 1 55	1 45 to 1 55	1 45 to 1 55	1 50 to 1 60
78 to 80	65 to 68	68 to 70	80 to 82	78 to 82	74 to 75	82 to 90
70 to 1 00	80 to 1 20	nominal.	1 10 to 1 30	1 20 to 1 50	1 00 to 1 50	1 00 to 1 55
47 to 50	44 to 50	42 to 52	50 to 53	48 to 56	40 to 47	46 to 55
38 to 45	30 to 41	36 to 43	30 to 40	37 to 44	35 to 42	33 to 46
18 00 to 19 00	17 00 to 18 00	15 00 to ——	16 00 to 18 00	16 00 to 17 00	16 00 to 17 00	16 00 to 17 00
15 00 to 17 00	10 00 to 16 00	10 00 to 12 00	12 00 to 15 00	12 00 to 15 00	12 00 to 15 00	12 00 to 15 00
13 50 to 14 00	12 00 to 12 50	11 50 to 12 00	12 00 to 13 00	12 00 to 13 00	11 00 to 12 00	......
16 00 to 16 75	15 25 to 16 00	15 50 to 16 00	16 00 to 16 25	14 50 to 15 00	12 75 to 13 00	14 00 to ——
8½ to 9	7¾ to 8½	7⅛ to 8¼	7½ to 8¼	7 to 7¾	7 to 7¼	7⅞ to 8¼
20 to 24	18 to 22	20 to 22	22 to 25	27 to 30	28 to 31	25 to 27
16 to 18	13 to 15	16 to 18	18 to 20	20 to 23	24 to 27	20 to 24
12 to 13	11 to 12½	11½ to 11¾	13½ to 14	13½ to 14	13½ to 14	13 to 14
......	......	......	......	......	......	21 to 23
12 to 15	13 to 16	11¾ to 15	12½ to 15	14 to 16½	12¼ to 13	12¾ to 14
17⅛ to 19½	18 to 20¼	18 to 20	17½ to 19½	16½ to 18⅝	13½ to 14¾	14⅝ to 16½
6 to 22	6 to 22	6 to 22	7 to 15	7 to 15	6½ to 12	6½ to 12
8 to 35	8 to 35	8 to 31	9 to 31	9 to 31	7 to 25	7 to 25
8¾ to 10½	8½ to 10	9½ to 10½	9¾ to 11	10 to 11	9½ to 10¼	9½ to 10¼
35 to 43	35 to 40	42 to 45	42 to 45	42 to 45	42 to 45	40 to 42
40 to 43	40 to 43	45 to 47	45 to 47	45 to 48	45 to 46	40 to 42
25 to 27	25 to 27	28 to 30	28 to 30	28 to 30	28 to 30	25 to 27
30 to 35	35 to 37	35 to 37	35 to 37	35 to 36	35 to ——	32 to 33
33 to 35	33 to 35	33 to 36	33 to 36	33 to 35	30 to 33	30 to 32
8 50 to 11 00	7 50 to 10 00	6 75 to 9 00	6 75 to 9 50	......	7 50 to 8 75	6 50 to 9 00
7 00 to 8 50	7 00 to 8 00	5 75 to 7 00	6 50 to 7 50	......	......	5 75 to 7 00
6 25 to 8 50	6 00 to 7 50	4 50 to 7 62½	5 75 to 7 75	5 50 to 6 50	4 25 to 5 40	6 00 to 7 25
3 00 to 5 00	2 50 to 4 50	2 50 to 4 50	2 50 to 4 50	3 85 to 4 75	3 25 to ——	2 50 to 4 00

MARKET PRICES OF FARM

The following quotations represent the state of the market,

Product.	January.	February.	March.	April.	May.
CHICAGO—Continued.					
Wheat, No. 1 spring, bush.	$1 28 to $1 29	$1 31 to ——	$1 29 to $1 30	$1 26 to $1 28	....
No. 2 spring	1 23 to 1 24½	1 25⅝ to 1 26½	1 19 to 1 19¾	1 17 to 1 19½	1 23½ to 1 25
No. 3 spring	1 09 to 1 09½	1 12 to ——	1 06½ to 1 07	1 07 to 1 09½	1 15 to 1 15½
Rye, No. 2	68 to 69	68 to ——	64½ to 66	64½ to 65½	69 to 69½
Barley, No. 2	65 to 66	75 to 78	70 to 72	75 to 78	71½ to 81
Corn, No. 2	31 to 31½	30½ to 30⅝	31 to 31½	30½ to 33	30⅝ to 31½
Oats, No. 2	25 to 25⅛	25½ to 25⅝	25¾ to 26¼	24½ to 26	37½ to 38⅝
Hay, timothy, ton.	15 00 to 17 00	15 00 to 17 00	14 00 to 17 00	13 50 to 16 50	15 00 to 17 00
prairie	9 50 to 11 50	9 50 to 11 00	9 00 to 10 50	9 00 to 10 50	12 00 to 17 00
Pork, mess, bbl.	11 25 to 11 40	12 00 to ——	13 30 to 13 35	15 60 to ——	18 00 to 18 05
Beef, mess	8 50 to 9 00	8 50 to 9 00	8 50 to 9 00	9 00 to 9 50	9 00 to 9 25
extra mess	9 50 to 10 00	9 50 to 10 00	9 50 to 10 00	10 00 to 10 50	10 00 to 10 25
Lard, cental.	7 00 to 7 12½	7 27½ to 7 32½	7 57½ to 7 60	8 00 to 8 15	9 05 to 9 10
Butter, choice, lb.	23 to 38	21 to 26	25 to 29	27 to 33	30 to 36
fair to good	18 to 22	17 to 20	20 to 24	23 to 26	25 to 28
Cheese, N. Y. factory	13½ to 14½	14 to 15½	16 to 17	17 to 18	15 to 16
western factory	11 to 13	12 to 14	13½ to 15½	15 to 17	12 to 14
Sugar, N. O. common to choice	9¼ to 11½	8¾ to 11	8½ to 11	8¼ to 10½	8 to 10¼
Wool, tub-washed	55 to 65	55 to 65	53 to 63	51 to 61	45 to 55
fleece-washed	45 to 59	45 to 58	43 to 55	40 to 53	37 to 47
unwashed	33 to 38	33 to 40	31 to 35	28 to 33	27 to 33
pulled	48 to 50	48 to 50	44 to 48	42 to 46	38 to 43
SAINT LOUIS.					
Flour, superfine winter, bbl.	4 50 to 5 00	5 50 to 6 10	5 25 to 5 60	4 85 to 5 40	3 50 to 5 35
extra, winter	5 25 to 7 50	6 25 to 7 35	5 75 to 8 50	5 50 to 8 00	5 75 to 7 50
choice winter	7 75 to 9 25	7 60 to 10 50	8 75 to 10 75	8 50 to 10 50	8 00 to 9 25
Wheat, No. 1 red winter, bush.	1 87 to 1 90	....	1 90 to 1 95	....	....
No. 2 red winter	1 80 to 1 88	2 00 to 2 05	1 90 to ——	1 82 to 1 89	1 80 to ——
No. 2 spring	1 25 to 1 30	1 35 to 1 45	1 20 to 1 25	1 20 to 1 40	1 25 to ——
Rye	70 to 75	74 to 78	62 to 73	65½ to 69	68 to ——
Barley	50 to 75	50 to 1 10	50 to 1 00	66 to 1 20	90 to 1 00
Corn	33 to 35½	31 to 39	32 to 48	32 to 45½	37½ to 46½
Oats	26½ to 35	26 to 34	26 to 34	27 to 35	31 to 33
Hay, ton.	17 00 to 19 00	15 00 to 26 00	15 00 to 25 00	10 00 to 22 00	12 00 to 20 00
Pork, mess, bbl.	12 00 to ——	11 75 to 12 25	13 50 to 14 00	15 00 to 16 00	18 00 to 18 50
Beef, mess	14 00 to ——	14 00 to 15 00	14 00 to ——	14 00 to ——	14 00 to ——
Lard, lb.	6⅞ to 8⅜	6⅞ to 7	7 to 7½	7½ to 9¼	7⅞ to 10¼
Butter, choice	25 to 28	25 to 28	27 to 32	27 to 33	30 to 35
prime	20 to 25	20 to 25	20 to 25	20 to 27	—— to 25
Cheese, choice factory	14¾ to 15	14½ to 15	15 to 16	15 to 16	15 to 15½
Sugar, New Orleans common to choice	9½ to 11	10 to 11¼	9 to 11	9½ to 10¾	9¼ to 11¼
Cotton, middling	19 to 19½	18½ to 19½	18½ to 19	18 to ——	18¼ to 18½
Wool, unwashed clothing	30 to 41	33 to 38	28 to 35	....	25 to 30
unwashed combing	....	42 to ——	37 to 40	28 to 38	35 to ——
tub-washed	50 to 60	57 to 60	47 to 60	40 to 54	43 to 50
fleece-washed	....	45 to 55	....	....	37 to 47
NEW ORLEANS.					
Flour, superfine, bbl.	6 25 to ——	6 85 to 7 25	6 62½ to ——	5 12½ to 5 90	5 50 to ——
extra	6 50 to 8 50	7 50 to 9 00	6 90 to 8 50	6 25 to 8 25	5 75 to 8 25
choice	9 00 to 11 00	9 50 to 11 25	9 00 to 11 25	8 50 to 10 50	8 50 to 10 00
Corn, white, bush.	83 to 85	75 to 78	65 to 68	58 to 60	57 to 59
yellow	80 to ——	75 to ——	68 to 70	58 to 59	57 to 58
Oats	50 to 52	55 to ——	50 to 52	44 to 45	43 to 44
Hay, choice, ton.	—— to 45 00	55 00 to ——	29 00 to 30 00	27 00 to 27 50	27 00 to 28 00
prime	40 00 to 42 00	....	25 00 to 26 00	25 00 to 27 00	23 00 to 25 00
Pork, mess, bbl.	13 75 to 14 00	14 50 to 15 50	14 00 to 15 25	17 25 to 17 50	18 50 to 19 00
Beef, Texas mess	11 00 to 11 50	11 50 to 12 00	11 50 to 12 50	11 50 to 12 50	11 00 to 12 00
Northern and western mess, bbl.	16 00 to 17 50	16 00 to 17 00	15 00 to 16 50	15 00 to 16 50	14 00 to 15 00
Fulton M'rk't, ½ bbl.	11 50 to 12 00	12 00 to 12 50	12 25 to ——	12 25 to ——	12 00 to ——
Lard, lb.	8¼ to 10	8 to 9¾	8 to 9½	8½ to 9¾	8¾ to 10¾
Butter, western	12 to 26	15 to 27	—— to 28	—— to 32	—— to 45
Goshen	36 to 37	—— to 42	37 to 42	40 to 42	40 to 50
Cheese, western factory	14 to 16½	15 to ——	15 to 17	—— to 17½	—— to 13
New York cream	18 to ——	18 to ——	19 to ——	19 to 20	18 to 19
Sugar, common to choice New Orleans	6½ to 10	5¼ to 10½	5⅜ to 10½	6¾ to 9¾	7 to 9⅜
Cotton, ordinary to good ordinary	17 to 18¾	16 to 18½	15⅝ to 18	13½ to 17¾	12¾ to 15⅜

PRODUCTS FOR 1873.

as nearly as practicable, at the beginning of each month.

June.	July.	August.	September.	October.	November.	December.
$1 35 to $1 35½	$1 23 to $1 24½	$1 25 to ——	$1 18½ to $1 20	$1 04½ to $1 06	$1 00 to $1 04	$1 08 to $1 10½
1 30 to ——	1 15⅞ to 1 20	1 20 to 1 21	1 14 to 1 17	93 to 1 03	99 to 1 02	1 07¼ to 1 08
1 19 to 1 20	1 06 to 1 07	1 04½ to ——	1 10 to 1 10½	92 to 93½	95 to 96	1 04 to 1 04½
68½ to ——	57 to 63	55 to 58	68 to 68½	57 to 62	60 to 61	69 to 71
70 to 78	55 to 60	70 to 81½	1 12 to 1 17	1 28 to 1 30	1 23 to 1 25	1 36 to 1 38
38¼ to 39½	33¼ to 34¾	36⅝ to 37	40⅝ to 41	34 to 37	36 to 36⅝	44¾ to 46
32¼ to 32⅝	29 to 30	26½ to 26¾	27⅝ to 28¼	30½ to 32	28¾ to 29⅝	32½ to 34
15 50 to 17 50	13 00 to 15 00	13 00 to 16 50	10 00 to 15 00	10 00 to 15 00	11 00 to 15 00	11 00 to 15 00
12 00 to 16 00	9 00 to 11 00	7 00 to 11 00	8 00 to 11 00	8 00 to 10 50	8 00 to 10 00	7 00 to 10 00
16 15 to 16 20	14 00 to 14 25	15 55 to 15 62½	15 75 to 15 85	14 50 to ——	12 00 to 12 25	12 87½ to 13 25
9 00 to 9 25	8 75 to 9 00	8 75 to 9 00	8 75 to 9 00	8 75 to 9 00	8 00 to 8 25	8 00 to 8 25
10 00 to 10 25	9 75 to 10 00	9 75 to 10 00	9 75 to 10 00	9 75 to 10 00	9 00 to 9 25	9 00 to 9 25
8 50 to ——	8 10 to 8 50	7 50 to 7 90	7 62½ to 7 87½	7 50 to 7 75	6 87½ to 7 00	6 87½ to 8 50
22 to 25	18 to 21	19 to 21	22 to 25	25 to 28	25 to 30	26 to 30
18 to 20	15 to 16	16 to 17	17 to 20	18 to 22	19 to 24	19 to 24
12½ to 13½	11 to 12	11 to 12	12½ to 13½	12 to 13	13 to 13½	13 to 13½
11 to 12½	9 to 10½	9½ to 11	11 to 12½	8 to 12	12 to 13	12 to 13
7¾ to 10	7½ to 9¾	8 to 10	8 to 9¼	8 to 10⅛	7¾ to 9½	7¼ to 9¼
45 to 52	40 to 46	40 to 48	40 to 48	40 to 52	40 to 52	40 to 50
37 to 45	38 to 43	35 to 42	35 to 42	38 to 44	38 to 43	36 to 43
27 to 30	25 to 26	25 to 26	25 to 30	25 to 32	24 to 32	24 to 30
38 to 44	38 to 44	35 to 38	35 to 38	35 to 38	35 to 38	35 to 38
3 00 to 4 00	3 00 to 4 95	3 50 to 5 00	4 75 to 5 75	4 25 to 5 00	3 25 to 5 25	4 00 to 5 25
5 75 to 7 00	5 00 to 7 00	5 75 to 7 00	6 00 to 6 75	6 25 to 7 50	5 50 to 7 00	5 50 to 7 50
8 00 to 8 87½	7 25 to 9 00	7 25 to 9 25	7 00 to 9 25	8 50 to ——	7 30 to 8 65	7 75 to 9 00
1 65 to 1 70	....	1 48 to ——	1 45 to 1 60	1 43 to 1 50	....	....
1 60 to 1 65	1 67½ to ——	1 37 to 1 40	1 33 to 1 40	1 35 to 1 40	1 55 to 1 60	1 58 to 1 63
1 30 to ——	....	....	1 00 to 1 10	1 06 to 1 11	1 02 to 1 05	1 10 to ——
61 to 70	—— to 55	68 to ——	62 to 80	63 to 65	74 to 75	75 to 85
65 to 70	No market.	65 to ——	93 to 1 09	1 05 to 1 55	1 00 to 1 50	90 to 1 60
37 to 48	41 to 47	37½ to 46½	44 to 55½	40 to 51	40 to 47	40 to 51
32 to 42½	23 to 33	29½ to 36	33 to 37	35 to 41	35 to 42	36 to 38
12 00 to 22 00	14 00 to 21 00	13 50 to 21 00	17 50 to 19 50	12 00 to 20 00	12 00 to 17 00	14 00 to 18 00
16 75 to 17 50	15 00 to 15 75	16 75 to 17 00	16 75 to 17 00	15 50 to 16 00	13 50 to 13 75	13 00 to ——
14 00 to ——	14 00 to ——	14 00 to ——	14 00 to ——	14 00 to ——	14 00 to ——	13 00 to ——
7½ to 9	7 to 8½	7 to 9½	7¼ to 9¾	8¼ to 9¾	7 to 9⅝	7¾ to 8¾
19 to 22	18 to 20	22 to 24	24 to 27	28 to 30	30 to 32	28 to 30
15 to 18	14 to 16	16 to 17	19 to 22	20 to 25	18 to 23	24 to 25
15 to 15½	15 to 15¼	10½ to 11½	13 to 14	13 to 14	13½ to 14½	13¼ to 14
8½ to 10½	9½ to 11½	9 to 10¼	9 to 10¼	9½ to 10¼	9 to 10¼	8½ to 10
18 to 18½	18½ to 19	18½ to ——	18 to ——	17½ to ——	13¼ to 14	15 to ——
27 to 30	22 to 28½	26 to 30	....	....	....	24 to 27
32 to 35	....	....	35 to 38	22 to 35	23 to 33	....
45 to 52	35 to 47	42 to 48	50 to 51	45 to 47	40 to 47	44 to 46
37 to 45	35 to 40	....	38 to 45	....	34 to 40	....
5 00 to 5 25	5 00 to ——	4 25 to 4 50	....	5 00 to ——	....	4 50 to 4 75
5 50 to 7 75	5 25 to 6 90	5 00 to 6 75	5 75 to 7 45	5 50 to 7 50	6 25 to 8 50	5 25 to 6 75
8 25 to 10 50	7 50 to 9 50	7 00 to 10 00	7 50 to 9 75	7 75 to 9 75	8 75 to 9 75	7 00 to 9 50
57 to 58	59 to 60	72 to 73	68 to 68½	—— to 73	80 to ——	78 to ——
57 to ——	58 to ——	....	....	—— to 75	80 to ——	75 to ——
45 to 46	40½ to 42	42 to 43	43 to 48	50 to 53	51 to 58	55 to 57
26 00 to 27 00	25 00 to 26 00	25 00 to ——	27 00 to 28 00	26 00 to 27 00	27 00 to ——	27 00 to 27 50
21 00 to 25 00	22 00 to 24 00	22 00 to ——	22 00 to 26 00	23 50 to 24 50	24 00 to 25 00	26 00 to 25 50
17 25 to 17 50	16 75 to 17 00	16 87½ to 17 00	17 00 to 18 50	17 00 to ——	15 50 to 16 00	14 62½ to 15 00
11 00 to ——	11 00 to ——	11 00 to ——	11 00 to ——	8 50 to ——	10 50 to ——	10 50 to ——
14 00 to 15 00	14 00 to 15 00	14 00 to 15 00	14 00 to 15 00	14 00 to 15.00	14 50 to 15 00	14 00 to 15 00
12 00 to ——	11 50 to ——	10 50 to 10 75	10 25 to ——	10 75 to ——	10 50 to ——	10 50 to ——
9½ to 10½	8½ to 10	8½ to 10½	8⅝ to 11¼	8⅞ to 10½	8⅝ to 10½	8½ to 9¾
26 to 28	—— to 23	—— to 22	—— to 25	—— to 28	—— to 30	—— to 28
25 to 38	—— to 32	—— to 35	—— to 35	—— to 38	—— to 40	—— to 38
—— to 16	—— to 17	—— to 13	—— to 14	—— to 16¼	—— to 15½	—— to 14
—— to 20	—— to 17	—— to 16	16 to ——	17 to 18	—— to 17	—— to 17
—— to 9½	—— to 9½	—— to 10¾	—— to 10½	9 to 10⅝	—— to 10⅛	6 to 9
12 to 16	12½ to 16⅝	11½ to 17	12¼ to 16½	16⅜ to 16½	14 to 14½	12½ to 14½

MARKET PRICES OF FARM

The following quotations represent the state of the market,

Products.	January.	February.	March.	April.	May.
NEW ORLEANS—Cont'd.					
Cotton, low middling to good middling, lb.	\$0 19⅛ to \$0 20¼	\$0 18¾ to \$0 21	\$0 18⅞ to \$0 20½	\$0 18¼ to \$0 20¾	\$0 17½ to \$ 020
Tobacco, lugs	8 to 9	8 to 9½	8 to 9	8 to 9	8 to 8½
low leaf	9 to 9¾	9 to 10	9 to 10	9 to 10	9 to 9½
medium leaf	9¾ to 10¾	10 to 11½	10 to 11	10 to 11	10 to 10½
Wool, Louisiana, clean	38 to 40	35 to ——	30 to 35	25 to 30	20 to ——
lake	47 to 50	45 to ——	40 to 42	30 to 35	25 to 26
SAN FRANCISCO.					
Flour, superfine, bbl.	4 20 to 4 50	4 50 to 5 00	4 50 to ——	4 50 to 4 80	5 00 to ——
extra	5 50 to 6 00	5 50 to 5 75	5 25 to ——	5 00 to 5 25	5 25 to ——
higher grades	6 00 to 6 25	6 00 to 6 25	—— to 5 75	5 50 to 5 75	5 50 to ——
Wheat, State, cental.	1 80 to 2 05	1 75 to 2 00	1 50 to 1 90	1 50 to 1 87½	1 75 to 1 90
Oregon	1 80 to 2 05	1 80 to 2 00	1 75 to 1 85	1 75 to 1 85	1 75 to 1 85
Barley	1 30 to 1 45	1 15 to 1 45	1 38 to 1 40	1 15 to 1 40	1 15 to 1 40
Oats	2 00 to 2 25	2 00 to 2 15	2 00 to 2 25	2 25 to 2 40	2 15 to 2 35
Corn, white	1 25 to ——	1 25 to 1 30	1 25 to ——	1 25 to 1 30	1 15 to ——
yellow	1 25 to ——	1 15 to 1 20	1 25 to ——	1 20 to 1 25	1 12½ to 1 15
Hay, ton.	15 00 to 23 00	15 00 to 22 50	15 00 to 22 50	14 00 to 22 50	11 00 to 21 00
Pork, mess, bbl.	19 00 to 20 00	18 00 to 20 00	18 00 to 19 00	18 00 to 19 00	19 00 to 19 50
prime mess	18 00 to 18 50	17 50 to 18 00	17 50 to 18 00	17 50 to 18 00	18 50 to ——
Beef, mess	—— to 12 50	10 00 to 11 50	10 00 to 12 00	10 00 to 12 00	10 00 to 12 00
family mess, hf. bbl.	9 00 to 10 00	9 00 to 10 00	9 00 to 10 00	9 00 to 10 00	9 00 to 10 00
Lard, lb.	9 to 11	9 to 11	9½ to 11	9⅝ to 11	10¾ to 12½
Butter, overland	15 to 35	15 to 35	15 to 30	15 to 20	15 to 20
California	40 to 60	40 to 50	30 to 35	22½ to 27½	25 to 30
Oregon	18 to 20	18 to 20	18 to 20	15 to 18	15 to 18
Cheese	12 to 16	12 to 16	12 to 16	12 to 16	12 to 16
Wool, native	12 to 20	12 to 20	12 to 20	10 to 12	11 to 14
California	25 to 28	25 to 28	25 to 28	20 to 25	18 to 22
Oregon	25 to 28	25 to 28	25 to 28	20 to 25	18 to 22

PRODUCTS DURING 1873.

as nearly as practicable, at the beginning of each month.

June.	July.	August.	September.	October.	November.	December.
$0 16⅞ to $0 19⅝	$0 17⅞ to $0 19⅜	$0 17¾ to $0 20	$0 17½ to $0 19½	$0 17¼ to $0 18⅝	$0 14¾ to $0 17	$0 15 to $0 18
7¼ to 9	7¼ to 9	6½ to 8½	6½ to 8½	8 to 8½	6 to 8	6 to 8
9 to 10	9 to 10	9 to 10	9 to 10	9 to 9½	8½ to 9	8½ to 9
10 to 11	10½ to 11	10½ to 11	10½ to 11	10 to 10½	9½ to 10	9½ to 10½
28 to ——	20 to ——	18 to 20	18 to 22	19 to 21	19 to 21	....
30 to ——	25 to 26	26 to 27½	25 to 26	26 to 27	26 to 27	22 to 24
4 50 to 5 25	4 00 to 4 50	4 00 to 4 25	5 00 to 5 25	5 75 to 6 00	5 37½ to 5 50	5 50 to 5 75
5 25 to 5 50	5 00 to 5 25	4 50 to 5 00	5 50 to 6 00	6 75 to 7 00	5 75 to 6 00	6 00 to ——
5 75 to 6 00	5 50 to ——	5 25 to 5 50	6 00 to 6 25	7 00 to 7 25	6 50 to 6 75	6 25 to 7 00
1 85 to 1 90	1 65 to 1 75	1 65 to 1 80	2 05 to 2 25	2 05 to 2 25	2 15 to 2 35	2 15 to 2 35
1 85 to 1 90	1 65 to 1 70	1 65 to 1 75	2 05 to 2 25	2 05 to 2 25	2 05 to 2 30	2 15 to 2 35
1 25 to 1 50	1 10 to 1 30	1 10 to 1 30	1 40 to 1 65	1 45 to 1 65	1 35 to 1 65	1 45 to 1 65
1 35 to 2 10	1 75 to 1 90	1 65 to 1 70	1 65 to 1 90	1 65 to 1 90	1 40 to 1 65	1 60 to 1 85
1 25 to 1 30	1 25 to 1 30	1 30 to ——	1 60 to 1 65	1 60 to 1 65	1 25 to 1 35	1 55 to 1 60
1 25 to 1 30	1 25 to 1 30	1 25 to 1 27½	1 60 to 1 65	1 60 to 1 65	1 25 to 1 30	1 55 to 1 60
10 00 to 21 00	12 00 to 15 00	12 00 to 15 50	13 00 to 16 00	15 00 to 16 00	—— to 17 50	15 00 to 20 00
18 00 to 18 50	18 00 to 18 50	18 00 to 18 50	18 00 to 18 50	18 00 to 18 50	18 00 to 18 50	18 00 to 18 50
17 00 to 17 50	17 00 to 17 50	17 00 to 17 50	16 00 to 17 50	16 00 to 17 50	16 00 to 17 00	16 00 to ——
10 00 to 12 00	10 00 to 12 00	11 50 to ——	10 00 to 10 50	10 00 to 10 50	10 00 to 11 00	9 00 to 10 00
9 00 to 10 00	9 00 to 10 00	9 00 to 10 00	9 00 to 10 00	9 00 to 10 00	9 00 to 10 00	9 00 to 10 00
10⅓ to 12	10⅓ to 12	10½ to 12	10½ to 12	9¾ to 12	10 to 12	9½ to 11
15 to 18	15 to 18	15 to 25	20 to 25	20 to 25	20 to 25	15 to 25
25 to 32½	25 to 30	25 to 30	30 to 45	30 to 50	20 to 35	30 to 60
15 to 18	15 to 18	15 to 18	15 to 20	15 to 20	15 to 20	15 to 20
12 to 14	12 to 15	12 to 15	10 to 15	13 to 15	14 to 16	14 to 16
12 to 15	12½ to 15	13 to 16	13 to 15	13 to 15	13 to 14	14 to 16
18 to 22	18 to 24	18 to 25	18 to 25	18 to 24	16 to 20	16 to 20
18 to 22	18 to 24	18 to 25	24 to 25	21 to 23	—— to 20	18 to 20

MARKET PRICES

The following quotations represent the state of the markets,

Products.	JANUARY. From—	JANUARY. To—	FEBRUARY. From—	FEBRUARY. To—	MARCH. From—	MARCH. To—	APRIL. From—	APRIL. To—	MAY. From—	MAY. To—
NEW YORK.										
Cattle, ex. to choice. cental.	$13 75	$14 50	$13 50	$14 00	$13 50	$14 50	$13 00	$14 00	$12 50	$13 00
good to prime	12 00	13 50	12 00	12 50	12 00	13 00	12 00	12 50	12 00	12 25
common to fair	10 00	11 50	10 00	11 25	11 00	11 75	11 00	12 00	11 00	11 75
Cherokee and Texan	......	......	......	......	......	......	......	......	10 50	11 00
milch-cows .... head.	45 00	90 00	45 00	80 00	40 00	80 00	40 00	85 00	30 00	75 00
calves .... cental.	9 50	10 00	8 00	11 00	8 00	11 50	8 00	11 00	5 00	8 00
Sheep, adult	4 75	8 25	4 75	8 00	5 25	8 00	6 25	8 75	5 50	6 50
lambs	......	......	......	......	......	......	......	......	8 25	9 00
Swine	4 62½	4 87½	5 37½	5 75	5 50	5 75	6 50	6 75	6 00	6 31¼
BOSTON.										
Cattle, ex. to choice, cental.	7 25	8 25	7 25	8 00	7 00	8 00	7 00	8 00	9 50	11 00
first quality	6 50	7 00	6 00	7 00	6 25	6 50	6 00	6 50	8 00	9 00
second quality	4 75	6 00	4 75	5 50	4 25	5 25	4 50	5 50	6 00	7 50
working oxen...pair.	100 00	250 00	100 00	250 00	100 00	250 00	100 00	250 00	100 00	275 00
milch-cows, with calves .... head.	40 00	85 00	40 00	85 00	35 00	85 00	35 00	85 00	35 00	87 00
veal-calves	......	......	......	......	......	......	5 00	15 00	4 00	13 00
Sheep, spring-lambs	6 75	7 75	6 75	8 00	6 50	8 50	6 00	8 00	7 00	8 50
adult	......	......	......	......	......	......	3 50	8 00	3 50	7 00
Swine .... cental.	5 00	......	5 25	......	5 50	5 75	6 00	6 25	6 25	6 50
PHILADELPHIA.										
Cattle, ex. to choice..cental.	7 00	9 00	7 00	8 25	7 50	7 87½	8 00	8 25	7 25	8 25
common to good	5 00	6 75	4 50	6 50	4 00	4 75	6 87½	......	5 00	7 00
Sheep	5 00	7 00	4 50	8 00	5 00	8 00	5 00	8 25	4 50	8 00
Hogs, corn-fed	5 75	......	6 50	......	7 75	......	9 25	9 50	7 50	......
BALTIMORE.										
Cattle, best beeves..cental.	6 00	7 12	6 25	7 50	6 50	7 50	6 25	7 62	6 25	7 25
first quality	5 00	6 00	5 00	6 25	5 50	6 50	5 75	6 25	5 50	6 25
medium, or good fair quality	4 00	5 00	4 00	5 00	4 75	5 50	5 00	5 75	5 00	5 50
ordinary, thin steers, oxen, or cows	2 62	4 00	2 75	4 00	3 00	4 75	4 00	5 00	......	......
extreme range	2 62	7 12	2 75	7 50	3 00	7 50	4 00	7 62	5 00	7 25
average of the market	4 87	......	5 25	......	5 50	......	5 75	......	6 25	......
Sheep, adult	4 50	7 00	4 75	8 00	5 00	7 50	4 50	8 00	4 50	7 50
Swine	5 50	6 00	6 25	6 75	7 25	7 87½	7 75	8 75	7 25	7 75
CINCINNATI.										
Cattle, prime to ex. shipping grades..cental.	5 25	6 00	5 00	5 50	5 00	5 50	5 00	5 75	5 50	6 00
prime to extra butchers' stock	4 05	5 25	4 25	5 00	4 25	5 00	4 25	5 40	4 25	5 75
medium	3 50	4 00	3 25	4 00	3 25	4 00	......	......	3 50	4 50
inferior	2 50	3 00	2 50	3 00	2 75	3 00	2 25	2 75	......	......
Sheep, prime to extra	4 50	5 00	4 50	5 25	4 50	5 50	6 00	6 50	5 00	6 75
common to good	3 50	4 00	3 00	4 00	3 00	4 00	3 25	4 75	4 00	5 00
Swine	3 65	4 00	4 25	4 75	4 75	5 25	4 60	5 90	4 75	5 50
CHICAGO.										
Cattle, extra graded steers, av'g 1,450 lbs. and upward ... cental.	6 15	6 30	6 15	6 35	6 10	6 35	6 30	6 65	5 90	6 15
choice beeves, fine, fat, well formed, 3 to 5 year old steers, 1,250 to 1,400 lbs	5 75	6 00	5 75	6 00	5 60	5 90	5 80	6 15	5 50	5 70
good beeves, well fattened, finely formed steers, 1,100 to 1,300 lbs.	5 00	5 50	5 25	5 65	5 25	5 40	5 30	5 65	5 10	5 35
medium grades, steers in fair flesh, 1,100 to 1,250 lbs	4 50	4 75	4 50	5 00	4 75	5 00	4 80	5 10	4 80	5 00

OF LIVE STOCK.

as nearly as practicable, at the beginning of each month.

JUNE.		JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
From—	To—	From—	To—	From—	To—	From—	To—	From—	To—	From—	To—	From—	To—
$13 00	$13 50	$12 25	$13 00	$12 25	$12 50	$12 50	$12 75	....	$12 50	$12 00	$12 50	$12 00	$12 75
12 25	12 75	11 50	12 00	11 25	12 00	....	12 25	$11 00	12 00	10 50	11 75	11 00	11 75
10 00	11 75	9 50	11 25	10 25	11 00	9 50	....	10 75	11 25	10 00	10 50	9 00	10 50
9 50	10 50	8 50	10 50	7 50	9 50	6 50	10 00	7 50	10 00	6 75	9 25	7 00	10 00
40 00	80 00	35 00	70 00	25 00	65 00	30 00	65 00	30 00	80 00	45 00	85 00	40 00	80 00
6 00	10 00	4 00	10 00	5 00	8 50	8 22	10 00	5 00	10 00	6 00	10 00	5 00	10 00
5 50	6 62½	4 50	5 50	4 00	6 25	4 50	6 50	4 75	6 25	4 00	6 00	3 50	6 37½
10 00	14 00	8 00	11 00	5 50	8 50	5 25	8 00	7 00	8 75	5 50	7 50	7 00	....
7 00	7 25	5 25	....	5 00	5 25	4 87½	5 37½	6 00	....	4 75	5 00	5 00	5 25
7 00	7 75	7 00	7 25	6 50	7 25	6 00	7 12½	6 00	7 00	6 00	7 25	6 50	7 12½
6 37	6 62	6 00	6 75	5 62	6 25	5 25	5 75	5 00	5 75	5 00	5 50	5 00	6 00
5 25	6 00	5 50	6 00	5 00	5 50	4 75	5 00	4 50	5 00	4 00	4 50	4 00	4 75
100 00	275 00	100 00	275 00	100 00	275 00	100 00	250 00	100 00	225 00	100 00	250 00	100 00	250 00
35 00	90 00	35 00	90 00	35 00	75 00	35 00	80 00	35 00	80 00	35 00	100 00	35 00	95 00
3 00	10 00	3 00	10 00	4 00	12 00	4 00	12 00	4 00	15 00	4 00	12 00	4 00	12 00
9 00	12 00	9 00	10 00	6 50	6 50	6 00	7 50	6 00	7 00	4 50	6 50	4 50	6 00
3 00	8 00	3 00	6 50	3 00	6 00	3 00	5 50	2 25	5 00	4 50	4 87½	2 00	5 50
6 00	6 25	5 75	6 00	6 00	....	6 00	....	5 50	5 75	5 00	5 50	3 00	5 25
....	8 00	5 25	7 75	6 25	7 75	5 00	7 25	5 50	7 50	5 00	7 00	5 25	7 25
4 00	....	4 50	5 50	4 50	5 50	3 50	4 50	4 00	5 00	3 50	4 50	4 00	5 00
5 00	6 25	4 50	5 50	4 50	5 75	4 50	6 00	4 00	5 75	4 00	6 00	4 50	5 00
8 00	8 25	7 25	7 50	7 50	7 75	7 75	....	7 25	....	6 50	6 62½	6 75	7 00
6 12	7 12	5 75	7 00	5 50	6 87½	5 37	6 50	5 00	6 00	4 87	6 12	5 00	6 25
5 37	6 12	5 25	5 75	4 50	5 50	4 37	5 37	4 50	5 00	4 00	4 87	4 00	5 00
5 00	5 37	4 50	5 25	4 00	4 50	3 87	4 37	3 50	4 25	3 12	4 00	3 00	4 00
4 50	5 00	4 00	4 50	3 50	4 00	3 25	3 87	3 00	3 50	2 50	3 12	2 00	3 00
4 50	7 12	4 00	7 00	3 50	6 87½	3 25	6 50	3 00	6 00	2 50	6 12	2 00	6 00
6 00	....	5 50	....	5 12	....	4 75	....	4 62	....	4 25	....	4 12	....
4 50	6 50	4 50	5 50	4 50	6 00	2 00	5 75	2 00	5 50	2 00	6 50	4 50	5 50
7 50	7 25	6 50	7 50	7 25	7 62½	6 50	7 37½	6 75	7 37½	5 50	6 50	5 50	6 25
5 00	5 75	5 00	5 75	4 75	5 00	....	....	....	....	....	....	....	....
5 50	5 75	4 75	5 00	4 25	4 75	4 75	5 00	3 75	4 50	4 00	4 75	3 75	5 00
3 50	5 00	3 50	4 50	3 75	4 25	3 75	4 00	2 75	3 25	2 75	3 00	3 00	3 50
2 50	3 00	2 50	3 25	2 25	3 50	2 25	3 25	2 25	2 50	1 50	2 00	2 25	2 75
4 50	6 50	4 75	....	4 00	....	4 25	....	4 25	....	3 50	4 00	3 50	4 50
3 50	4 50	2 50	....	3 00	....	3 00	....	2 75	....	2 50	3 25	....	....
4 75	5 25	4 40	4 80	4 60	5 00	4 50	4 75	4 00	4 60	3 90	4 10	4 40	4 95
5 80	6 10	5 85	6 10	5 80	6 10	5 80	6 00	5 75	6 00	5 60	5 80	5 40	5 50
5 50	5 70	5 60	5 75	5 40	5 65	5 40	5 70	5 25	5 60	5 25	5 50	5 75	5 60
5 25	5 40	5 25	5 35	5 00	5 25	4 80	5 20	4 60	5 00	4 50	5 00	4 25	4 60
4 80	5 15	4 80	5 15	4 60	4 90	4 50	4 75	4 25	4 50	4 00	4 35	3 75	4 00

MARKET PRICES

The following quotations represent the state of the markets,

Products.	January.		February.		March.		April.		May.	
	From—	To—	From—	To—	From—	To—	From—	To—	From—	To—
CHICAGO—Continued.										
Cattle—Continued.										
stock-cattle, decently fleshed, 700 to 1,050 lbs. cental.	$3 00	$4 00	$3 00	$4 00	$3 25	$4 25	$3 40	$4 40	$3 85	$4 90
Texans	2 75	4 50	2 50	4 50	2 50	4 50	3 00	5 00	4 00	5 20
Sheep, good to choice	......	5 25	4 75	5 75	4 75	5 50	5 00	6 00	5 75	6 50
common to fair	3 25	......	3 50	4 50	3 75	4 50	4 25	4 75	4 75	5 50
Swine, good to choice	......	3 90	......	4 25	4 85	5 00	5 60	5 70	5 45	5 50
poor to fair	3 55	......	3 85	......	......	4 80	5 25	5 50	5 20	5 40
SAINT LOUIS.										
Cattle, choice native steers, av'g from 1,300 to 1,600 lbs. cental.	5 50	6 00	5 50	6 00	5 75	6 25	6 00	6 25	6 00	6 50
prime 2d class, averaging from 1,050 to 1,400 lbs	4 50	5 00	4 50	5 00	4 75	5 25	5 00	5 50	5 50	6 00
good 3d class, averaging from 1,050 to 1,300 lbs	4 00	4 50	4 00	4 50	3 75	4 25	4 00	4 50	4 50	5 00
inferior natives	1 50	4 00	2 50	4 00	1 75	4 50	1 75	4 50	2 00	4 50
Texans and Cherokees, all grades	1 50	4 50	1 50	4 50	1 75	4 75	1 75	4 50	2 00	5 50
milch-cows with calves head.	25 00	50 00	25 00	50 00	25 00	50 00	30 00	50 00	25 00	60 00
veal-calves, common to choice	6 00	10 00	6 00	10 00	6 00	10 00	6 00	10 00	6 00	10 00
Sheep cental.	4 60	......	3 00	5 25	3 00	5 25	3 00	6 00	3 50	6 75
Swine, good to extra	3 55	3 70	4 10	4 25	4 70	5 00	4 65	5 50	5 20	5 35
common to fair	3 30	3 50	3 85	4 05	4 25	4 60	4 60	4 80	4 95	5 10
Horses, driv'g-animals h'd.	......	......	......	......	100 00	200 00	100 00	200 00	90 00	200 00
draught animals	......	......	......	......	50 00	175 00	50 00	175 00	40 00	175 00
Mules, 14 to 15 hands high	......	......	......	......	85 00	150 00	85 00	140 00	85 00	130 00
15½ hands and upward	......	......	......	......	150 00	200 00	150 00	200 00	125 00	175 00
NEW ORLEANS.										
Cattle, Texan beeves 1st quality head.	35 00	45 00	35 00	45 00	35 00	45 00	35 00	45 00	35 00	45 00
2d quality	20 00	28 00	20 00	28 00	20 00	28 00	20 00	28 00	20 00	28 00
western beeves, net cental.	......	......	10 00	12 50	10 00	12 50	11 00	13 00	10 00	12 50
milch-cows head.	50 00	100 00	50 00	100 00	50 00	100 00	50 00	100 00	35 00	100 00
calves	7 00	10 00	8 00	12 00	8 00	12 00	8 00	12 00	8 00	12 00
Sheep, 1st quality	5 00	6 00	5 00	7 00	5 00	7 00	5 00	7 00	5 00	6 00
2d quality	3 00	4 05	3 00	4 05	3 00	4 05	3 00	4 05	3 00	4 05
Swine cental.	5 50	6 00	5 50	6 50	5 50	6 50	7 00	7 50	6 00	7 00

OF LIVE STOCK.

as nearly as practicable, at the beginning of each month.

JUNE.		JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
From—	To—	From—	To—	From—	To—	From—	To—	From—	To—	From—	To—	From—	To—
$3 75	$4 00	$3 50	$4 50	$3 00	$4 25	$2 75	$4 00	$2 75	$3 85	$2 50	$3 65	$2 35	$3 00
4 00	5 25	2 25	4 75	2 00	4 50	2 00	4 50	1 75	4 75	1 60	4 75	1 60	4 50
....	5 50	4 25	4 50	4 25	5 00	....	4 50	....	4 75	3 50	4 00	3 50	4 00
4 00	....	3 00	4 00	3 00	4 00	3 00	....	3 25	....	2 75	3 25	2 75	3 25
4 80	4 95	4 50	4 65	4 55	4 90	4 50	4 85	....	4 55	3 90	4 00	4 20	4 35
....	4 75	4 25	4 45	4 30	4 50	4 25	4 50	4 00	....	3 50	3 70	4 00	4 15
5 75	6 00	5 50	5 75	5 25	5 75	5 25	5 75	5 25	5 50	5 00	5 50	4 75	5 00
5 25	5 75	4 75	5 00	4 75	5 25	4 75	5 25	4 75	5 00	4 50	5 00	4 25	4 50
4 50	5 00	4 00	4 50	4 00	4 50	4 00	4 50	3 75	4 00	3 75	4 25	3 25	3 33⅓
2 50	4 70	2 00	4 50	2 50	4 50	1 50	4 00	1 75	4 00	1 50	4 50	1 75	3 25
3-50	5 00	1 50	4 50	1 50	4 25	1 50	3 50	1 50	3 75	1 25	4 00	1 50	3 75
25 00	60 00	25 00	50 00	....	....	....	....	....	....	....	....	....	....
6 00	10 00	8 00	10 00	6 00	7 00	....	....	....	....	....	....	....	....
3 00	6 50	2 50	4 25	4 25	....	3 20	3 50	2 90	4 12½	3 00	3 62½	1 75	4 25
4 55	4 60	4 20	4 25	4 30	4 40	....	4 50	4 00	....	....	4 25	4 10	4 25
4 35	4 45	3 90	4 15	4 00	4 15	4 00	4 10	....	....	3 70	....	4 00	4 05
85 00	225 00	100 00	225 00	125 00	225 00	90 00	225 00	85 00	225 00	....	....	75 00	150 00
40 00	220 00	40 00	175 00	40 00	230 00	40 00	225 00	40 00	200 00	25 00	175 00	40 00	200 00
85 00	135 00	85 00	135 00	90 00	125 00	90 00	125 00	75 00	125 00	65 00	110 00	65 00	125 00
120 00	200 00	120 00	200 00	120 00	225 00	120 00	225 00	120 00	225 00	110 00	175 00	125 00	225 00
35 00	45 00	35 00	45 00	35 00	45 00	35 00	45 00	35 00	45 00	35 00	45 00	35 00	40 00
20 00	28 00	20 00	28 00	20 00	28 00	20 00	28 00	20 00	28 00	20 00	28 00	20 00	28 00
10 00	12 50	10 00	12 00	10 00	15 00	10 00	15 00	10 00	12 50	10 00	12 50	10 00	12 50
35 00	100 00	35 00	100 00	35 00	100 00	35 00	100 00	35 00	100 00	35 00	100 00	35 00	100 00
8 00	12 00	7 00	10 00	7 00	10 00	7 00	10 00	7 00	10 00	7 00	10 00	7 00	10 00
5 00	6 00	4 00	5 00	4 00	5 00	6 00	7 00	4 00	5 00	4 00	5 00	4 00	5 00
3 00	4 05	3 00	4 05	3 00	4 50	4 00	5 00	3 00	4 00	3 00	4 00	3 00	4 00
6 00	7 00	6 00	7 00	6 00	7 00	6 00	7 00	6 00	7 00	6 00	7 00	5 00	5 50

LIVE-STOCK MARKETS.

NEW YORK.

T live-stock market of New York during 1873 exhibited an increased offering of all classes of farm-animals except milch-cows, but the quality was below average and the market frequently glutted with inferior stock. Improvements in the arrangements for handling animals have been made, and others are in progress or contemplated. A general feeling in favor of the union of the different stock-yards has been expressed, but there are too many interests opposed to this needed reform.

The receipts of all classes of farm-animals during the last six years were as follows:

Animals.	1868.	1869.	1870.	1871.	1872.	1873.
Beeves	293, 101	325, 761	356, 026	380, 934	425, 275	442, 744
Cows	5, 382	4, 836	5, 050	4, 646	5, 089	4, 701
Calves	82, 935	93, 994	116, 457	121, 937	115, 130	116, 015
Sheep	1, 400, 623	1, 479, 563	1, 463, 878	1, 331, 975	1, 179, 518	1, 206, 715
Hogs	976, 511	901, 308	889, 625	1, 334, 492	1, 922, 727	1, 958, 389

Cattle.—The receipts of beeves show an increase over 1872 of 17,469. They are credited to the following States: Illinois, 233,460; Texas, 72,806; Kentucky, 38,512; Ohio 35,384; Missouri, 25,098; New York, 12,914; Indiana, 11,664; Iowa, 4,173; Kansas, 2,792; Virginia, 2,5[illegible]5; Canada, 1,191; Michigan, 1,163; Colorado, 488; Pennsylvania, 278; New Jersey, 118; Tennessee, 108; Maryland, 60.

Illinois, which gets credit for nearly all the native cattle shipped from Chicago, shows a decline from the figures of 1872, as also do Indiana, Virginia, Michigan, Pennsylvania, New Jersey, and Tennessee. All the other States increased their supply. Texas, to which is credited all the long-horned breed from the Southwest, increased her number 20 per cent. Other Western States and Territories show still higher rates of increase. Kansas and Colorado are looming up into great prominence as sources of supply. Connecticut and Delaware disappear from the list and Maryland re-appears.

The supply of milch-cows decreased 388. An inspection of the above table will show a biennial oscillation in the number of cows annually marketed in New York; the last year showed the regular decline. Veal-calves increased 885, presenting a similar alternation in the years under review.

The average prices per pound of beeves at the close of the first week in each month of 1873 were as follows: January, 11 cents; February, 11; March, 10¾; April, 11½; May, 11¼; June, 11; July, 11; August, 10¾; September, 10¾; October, 11; November, 9¾; December, 10¼.

Cattle products.—The receipts and shipments of cattle products for the last three years embrace the following:

Cattle-products.	1871.		1872.		1873.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
Beef.........barrels.	164, 603	45, 277	58, 505	36, 054	39, 468	41, 455
Beef.........tierces.	....	80, 402	....	49, 085	....	57, 364
Butter.......pounds.	....	7, 500, 347	....	4, 814, 497	....	3, 586, 103
Butter.....packages.	709, 473	....	680, 688	....	951, 932	....
Cheese.......pounds.	....	70, 245, 881	....	67, 109, 248	....	88, 860, 349
Cheese.....packages.	1, 467, 633	....	1, 714, 210	....	2, 032, 289	....

Sheep.—The sheep received during 1873 were 27,202 in excess of the receipts of 1872. During the greater part of the year the weak and dull wool-market caused sheep to be offered for sale in large numbers, but with very little reference to the demands of the meat-market. Hence low prices and slow sales were the general features of the trade. The prices of prime sheep ranged from 5½ cents per pound in November to 8 cents in the middle of January; prime lambs were at their maximum, 17 cents, at the close of April, and at their minimum, 6¾ cents, at the end of November.

Swine.—The receipts of live hogs increased 35,662 over 1872. The hog-trade is mostly confined to dressed hogs by slaughterers, who receive their supplies direct from western wholesale markets. Prices ranged higher than during 1872, but the fluctuations were frequent and considerable. The business was moderately remunerative. The character of the receipts indicated a scarcity of fat hogs in the country, and foreshadowed a decline of receipts during the first quarter of 1874. Live hogs were at their lowest point, 4 cents per pound, in November; they attained their maximum, 6½ cents, at the close of April; dressed hogs ranged from 5¾ in January to 8 cents at the close of April.

BOSTON.

Cattle-products.—The receipts and shipments of barreled beef, butter and cheese during the last three years were as follows:

Cattle-products.	1871.	1872.	1873.
RECEIPTS.			
Beef, mess ......barrels..	27, 441	24, 951	31, 080
Butter ......packages..	442, 316	461, 917	474, 067
Cheese ......casks..	554	283	264
Cheese ......boxes..	202, 487	187, 484	158, 094
Cheese ......tons..	131	129	72
SHIPMENTS.			
Beef, foreign ......barrels..	8, 114	7, 932	9, 466
Beef, coastwise ......do. ..	1, 354	904	678
Cheese, foreign ......boxes..	8, 719	4, 726	17, 867
Cheese, foreign ......casks..	68	....	2
Cheese, coastwise ......boxes..	1, 639	1, 922	968
Butter ......packages..	8, 594	6, 457	4, 334

Prices of mess beef and extra during the past eleven years have ranged as follows: 1863, $11 to $16; 1864, $14 to $20; 1865, $10 to $26; 1866, $16 to $24.50; 1867, $15 to $27; 1868, $15.50 to $25; 1869, $10 to $18; 1870, $12 to 19; 1871, $10 to $18; 1872, $10 to $14; 1873, $14 to $20.

Prices of butter and cheese during the last eleven years have ranged as follows:

Years.	Butter per pound.		Cheese per pound.
	Good and choice.	Common.	Common to prime.
1863	$0 16 to $0 32	$0 12 to $0 25	$0 06 to $0 16
1864	29 to 55	24 to 50	11 to 24
1865	28 to 55	15 to 50	6 to 23
1866	34 to 60	17 to 45	6 to 23
1867	23 to 45	10 to 35	5 to 21
1868	35 to 55	25 to 40	4 to 20
1869	35 to 50	20 to 40	6 to 24
1870	27 to 45	20 to 35	6 to 18½
1871	22 to 43	13 to 25	6 to 16
1872	20 to 37	12 to 25	6 to 20
1873	26 to 40	15 to 25	5 to 17

Hog-products.—The receipts and shipments of hog-products for the last three years were as follows:

Hog-products.	1871.	1872.	1873.
RECEIPTS.			
Pork.......barrels..	39, 754	36, 731	38, 538
Bacon.......boxes..	....	40, 332	74, 210
Hams.......casks..	3, 988	10, 300	8, 289
Hams.......barrels..	9, 961	5, 532	7, 411
Lard.......tierces..	37, 081	39, 644	49, 760
Lard.......kegs..	1, 665	754	2, 814
SHIPMENTS.			
Bacon, foreign.......boxes } Pork, foreign.......barrels }	63, 213	{ 107, 408 { 27, 063	229, 210 54, 536
Pork, coastwise.......do.......	4, 695	6, 005	2, 831
Lard, foreign.......tierces..	21, 335	28, 515	47, 848
Lard, coastwise.......do.....	690	508	516
Lard, foreign.......kegs and pails..	14, 758	13, 377	22, 516
Lard, coastwise.......do.......	832	812	2, 384

The range of prices of prime pork, mess pork, and lard during the past eleven years was as follows:

Years.	Prime pork.	Mess pork.	Lard.
	Per barrel.	*Per barrel.*	*Per pound.*
1863	\$11 50 to \$16 50	\$13 00 to \$22 60	\$0 10 to \$0 13¾
1864	16 00 to 40 00	21 00 to 45 00	13¼ to 25¼
1865	20 00 to 39 50	24 00 to 44 00	18 to 30
1866	18 00 to 31 00	22 00 to 35 00	13 to 23
1867	17 00 to 21 00	21 00 to 25 50	13 to 15
1868	18 50 to 26 00	23 00 to 31 50	13¾ to 21
1869	24 00 to 28 00	31 00 to 34 50	18½ to 21½
1870	16 00 to 26 00	20 00 to 23 00	12½ to 19
1871	11 00 to 19 00	13 50 to 23 50	9½ to 14
1872	11 25 to 13 00	13 75 to 17 00	8¼ to 10
1873	11 50 to 15 50	14 00 to 18 50	8 to 9¾

Sheep-products.—The range of prices of wool during 1873 was as follows: Ohio and Pennsylvania XX and Picklock, 45 cents to 70 cents per pound; medium and X, 45 to 68; Michigan, 43½ to 68; other western, 40 to 65. The receipts of domestic wool for ten years were as follows: 1864, 157,262 bales; 1865, 180,750 bales; 1866, 177,346 bales; 1867, 196,431 bales; 1868, 236,970 bales; 1869, 216,320 bales; 1870, 185,015 bales; 1871, 204,697 bales; 1872, 157,741 bales; 1873, 221,159 bales. The receipts of foreign wools during 1873 were 45,912 bales against 88,157 in 1872 and 56,772 in 1871. The stock on hand at the close of 1873 was 7,882,600 pounds against 3,662,000 pounds in 1872 and 7,165,000 pounds in 1871.

PHILADELPHIA.

The receipts of farm-animals at Philadelphia during the last twenty-four years were as follows:

Years.	Beeves.	Cows.	Swine.	Sheep.
1850	68,780	15,120	46,900	82,500
1851	69,100	15,400	46,700	83,000
1852	71,200	14,420	49,200	80,200
1853	71,900	16,300	53,300	72,300
1854	73,303	15,530	70,000	61,000
1855	55,250	11,530	65,300	135,500
1856	61,978	12,990	103,850	240,700
1857	64,100	14,700	95,700	342,000
1858	81,990	17,125	165,600	277,000
1859	87,555	11,153	151,236	272,160
1860	99,845	10,673	127,964	324,564
1861	82,365	4,217	199,179	260,020
1862	87,520	4,650	206,000	229,300
1863	103,150	6,905	167,370	275,100
1864	99,850	7,920	140,400	295,000
1865	96,450	6,540	136,300	306,000
1866	100,500	10,830	122,500	512,000
1867	90,150	11,464	175,500	368,500
1868	90,400	9,314	191,900	417,800
1869	99,486	8,085	176,200	536,500
1870	117,903	8,885	189,500	682,900
1871	125,333	11,150	199,610	790,200
1872	134,850	12,302	210,276	740,500
1873	165,860	18,406	344,300	753,750

CINCINNATI.

Cattle.—The annual receipts and shipments of cattle for the last ten commercial years, each closing August 31, are reported by the Chamber of Commerce as follows:

Years.	Receipts.	Shipments.	Years.	Receipts.	Shipments.
1864	39,152	14,903	1869	107,813	40,185
1865	54,424	19,070	1870	107,167	54,681
1866	79,503	31,300	1871	125,771	53,278
1867	91,406	43,079	1872	169,855	76,866
1868	87,459	43,315	1873	149,629	53,385

The reduction from the high figures of 1872 is mostly in the receipts and shipments of Texas cattle. The quality of the marketed animals generally was below the previous year. This was the result of the long and cold winter, and the consequent scarcity of food for stock. The range of prices was also greatly narrowed. Extra butchers' steers sold at $5.25 per cental in September, 1872. Prices rose to a maximum in May, 1873, but gradually fell to $4.87½ in December, the average being $4.99. The prices of this grade on the first Tuesday of each month for six years were as follows:

Months.	1872-'73.	1871-'72.	1870-'71.	1869-'70.	1868-'69.	1867-'68.
September	$5 25	$3 50	$6 25	$5 75	$6 00	$7 25
October	4 75	4 00	5 25	5 25	5 00	7 00
November	4 37½	3 50	4 75	4 50	5 00	6 50
December	4 87½	3 75	4 75	4 75	5 50	6 50
January	5 12½	4 50	5 25	5 50	5 50	6 50
February	5 12½	5 00	5 25	6 00	5 50	7 00
March	4 87½	4 75	5 35	5 00	6 00	7 75
April	5 12½	5 50	5 75	6 50	6 00	8 50
May	5 50	5 60	5 50	7 00	6 50	8 50
June	5 37½	5 50	4 50	7 00	6 00	8 25
July	5 12½	5 00	4 25	6 50	5 50	7 00
August	4 87½	5 25	3 50	6 25	5 50	6 75

The annual average prices of prime beef-cattle for ten years past were as follows: 1863-'64, $5.74; 1864-'65, $7.45; 1865-'66, $7.55; 1866-'67, $7.27½; 1867-'68, $7.27; 1868-'69, $5.62½; 1869-'70, $5.85; 1870-'71, $5.55; 1871-'72, $4.73½; 1872-'73, $4.99.

The comparative prices of all grades of beef-cattle at the close of the last three years were as follows:

	1870-'71.	1871-'72.	1872-'73.
Extra shipping.....per cental gross.	$4 75 to $4 50	$5 50 to $6 00	$5 00 to ——
Extra butchers.....do.....	3 50 to 4 25	4 75 to 5 25	4 50 to $4 75
Fair.....do.....	3 00 to 3 25	3 00 to 3 50	3 25 to 3 75
Common.....do.....	2 25 to 2 50	2 50 to 3 00	2 00 to 2 50

NOTE.—Nearly all the cattle quoted as "common" were Texans.

Cattle-products.—The better grades of butter ruled higher than during 1871-'72. Choice Central Ohio rose from 18 cents per pound in September to 36½ cents in April, but declined to 16 cents in June, and closed at 21 cents in August. At the commencement of the warm season there was a great destitution of butter, resulting from a protracted winter. The annual average prices for ten years were as follows: 1863-'64, 29 cents; 1864-'65, 35 cents; 1865-'66, 36⅓ cents; 1866-'67, 26½ cents; 1867-'68, 36½ cents; 1868-'69, 32⅞ cents; 1869-'70, 28⅓ cents; 1870-'71, 24⅝ cents; 1871-'72, 20⅖ cents; 1872-'73, 23⅕ cents.

Cheese.—The cheese business shows a considerable enlargement during the last commercial year. The receipts were 207,847 boxes, an increase of 20,207, and the shipments 145,360 boxes, an increase of 17,100. The improvement in quality becomes more noticeable as the factory system supersedes the dairy in the cheese-producing districts. Though the volume of business is increasing, it is also shifting its localities of distribution. Large districts once supplied by Cincinnati now draw from other points. Grocers and jobbers show a disposition to deal directly with the manufacturers rather than with commission merchants. Prices were steady during the last year, ranging from 11 to 16⅓ cents, according to quality, the ruling figures being between 14 and 15⅓. The annual average prices for these years were as follows: 1870-'71, 13¾ cents; 1871-'72, 14½ cents; 1872-'73, 14½ cents.

Sheep.—The receipts and shipments of sheep for the last ten years were as follows:

Years.	Receipts.	Shipments.	Years.	Receipts.	Shipments.
	Number.	*Number.*		*Number.*	*Number.*
1864.....	35,223	4,077	1869.....	117,548	31,353
1865.....	47,023	5,815	1870.....	90,205	35,581
1866.....	73,229	13,177	1871.....	134,892	51,109
1867.....	91,987	24,052	1872.....	187,522	68,541
1868.....	73,097	19,809	1873.....	131,633	62,755

The supply of sheep was smaller than in 1872, but the quality showed little if any variation. The better grades were generally shipped through. Prices ruled somewhat above the previous year, reaching $4.76¼ per cental gross against $4.41⅓. The extreme range was between $3.75 and $6.25.

Sheep-products.—Wool: The receipts and shipments of wool for ten years were as follows:

Years.	Receipts.	Shipments.	Years.	Receipts.	Shipments.
	Bales.	*Bales.*		*Bales.*	*Bales.*
1864	14,005	12,913	1869	13,827	15,058
1865	11,014	12,953	1870	11,971	15,655
1866	17,099	15,670	1871	16,728	19,432
1867	15,490	13,995	1872	11,082	12,177
1868	11,851	12,461	1873	9,213	10,657

NOTE.—Since 1855 the bales for shipment have been reduced to an average of 100 pounds each.

A large increase in combing-wools is noticeable during several years past, derived mostly from Kentucky and Indiana. The supplies of pulled wool have considerably fallen off. Wool-manufacture is very limited in this city, consequently the receipts are mostly sent eastward.

Hogs.—The whole number of hogs packed during the packing-season, from November 1, 1873, to March 1, 1874, was 581,253, a decrease of 45,052 from the previous year. The average gross weight per head was 280.75, a decrease of 24.14 pounds. The hogs packed during the last season, if reduced to the average weight of the previous year, would number but 535,235. The average yield of lard per head was 39.7 pounds, a decrease of 5.97 pounds. The average cost of hogs slaughtered, per cental, was $4.58, an increase of 65 cents. The summer packing of 1873 was 88,395 against 94,260 the previous year, a decrease of 5,865. The average gross weight was 247.94 pounds, a loss of 5.97 pounds. The average yield of lard per head was 34.99 pounds, a loss of 7.54 pounds as compared with the previous summer packing. The average cost per cental was $4.89½.

From the winter packing of 1873-'74 resulted 27,204 barrels of mess pork, a loss of 5,797; 941 barrels of prime mess, a gain of 463; 75 barrels of clear pork, a loss of 95; 2,534 barrels of rump pork, a loss of 40; 70,861 tierces of lard, a loss of 15,553; 514 barrels of lard, a gain of 143; 8,487 kegs of lard, a loss of 5,805. An increase of summer packing and a steady growth of pork-packing in the eastern cities is noted among circumstances affecting the live-stock trade of Cincinnati.

CHICAGO.

Horses.—The receipts and shipments of horses in 1873 were as follows

Months.	Receipts.	Shipments.	Months.	Receipts.	Shipments.
January	627	467	August	1,073	1,002
February	2,135	1,978	September	1,340	1,254
March	4,253	3,909	October	779	609
April	2,913	2,801	November	422	370
May	2,666	2,663	December	240	227
June	2,737	2,276			
July	1,104	984	Total	20,289	18,540

The aggregate value of the horses received during 1873 is estimated at $2,028,902. The total value of live-stock receipts is estimated at $91,321,162.

Cattle.—The monthly receipts and shipments of beef-cattle at the Union Stock-Yards during the last three calendar years were as follows:

Months.	1871.		1872.		1873.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
January	30,708	16,639	44,990	33,047	50,520	30,564
February	43,299	28,782	41,087	36,146	45,019	35,509
March	44,752	39,573	53,170	43,705	63,836	56,477
April	48,144	43,522	58,393	52,474	84,249	68,531
May	59,217	49,455	71,700	67,039	81,602	80,261
June	52,564	44,637	63,449	52,335	85,380	68,818
July	50,041	39,754	58,439	41,928	73,207	54,505
August	50,583	36,007	64,463	47,211	67,731	49,726
September	53,175	38,528	66,744	43,179	65,394	44,301
October	37,981	22,759	64,957	34,388	63,845	34,162
November	42,781	20,378	55,884	32,468	37,712	23,351
December	29,805	21,393	40,799	26,105	42,933	27,976
Total	543,050	401,927	684,075	510,025	761,428	574,181

The above figures show an increase in the receipts, during 1873, of 77,353, and in the shipments of 64,156. Neither the actual increase nor the rate of increase was so large as the previous year.

The gross value of the cattle received at the yards during the year is estimated at $35,264,260 against $41,000,000 in 1872. Of cattle-products, the receipts of barreled beef amounted to 7,219 barrels against 14,512 in 1872; the shipments were 41,011 barrels against 39,911. Of butter, the receipts were 21,059,075 pounds against 14,574,777; shipments, 10,848,760 pounds against 11,497,837. Of hides, the receipts were 34,193,372 pounds against 32,387,995; the shipments 31,839,310 pounds against 28,959,292. Of tallow, the receipts were 7,481,601 pounds against 6,403,842; shipments, 10,985,830 pounds against 5,745,849.

Sheep.—The monthly receipts and shipments of sheep at the Union Stock-Yards during the last three years were as follows:

Months.	1871.		1872.		1873.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
January	35,111	17,576	42,069	23,235	39,751	20,787
February	43,608	25,512	41,803	25,348	37,729	24,728
March	42,213	29,321	38,170	29,495	31,061	23,020
April	23,379	13,084	24,771	17,328	75,570	12,798
May	23,337	8,577	16,389	5,945	21,030	8,653
June	22,667	6,496	13,776	3,493	20,262	5,506
July	18,022	5,214	13,819	2,471	17,697	784
August	24,471	6,917	18,777	3,937	18,921	1,152
September	27,732	7,264	22,452	5,622	16,794	1,975
October	18,632	4,397	48,290	7,340	27,871	5,472
November	19,144	3,697	24,343	7,417	18,506	4,566
December	15,737	7,029	25,552	13,376	17,042	5,794
Total	315,053	135,088	310,211	145,016	291,734	115,235

There is a marked decline in both receipts and shipments. The total value of the animals received is estimated at $875,000 against $950,000 in 1872. Of sheep-products the receipts of wool amounted to 33,991,870 pounds against 28,180,509 pounds in 1872; shipments, 31,745,955 pounds against 27,710,089 pounds the previous year.

The monthly receipts and shipments of swine for the last three years were as follows:

Months.	1871.		1872.		1873.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
January	300, 697	26, 530	361, 935	78, 337	561, 245	95, 237
February	139, 342	47, 724	268, 236	104, 668	378, 760	163, 140
March	97, 058	75, 387	170, 785	144, 209	271, 626	224, 194
April	71, 632	63, 986	169, 149	145, 151	292, 903	225, 715
May	137, 521	111, 524	265, 259	196, 451	261, 361	217, 914
June	197, 490	160, 513	254, 714	206, 940	245, 860	189, 586
July	165, 831	134, 391	212, 030	172, 934	244, 550	201, 682
August	118, 975	98, 187	219, 406	198, 077	234, 145	188, 776
September	164, 749	125, 561	214, 728	186, 010	239, 512	191, 241
October	161, 212	131, 370	229, 304	175, 241	325, 716	196, 569
November	386, 766	113, 643	373, 963	132, 381	616, 301	156, 926
December	456, 831	67, 490	513, 114	95, 195	665, 771	146, 577
Total	2, 380, 083	1, 162, 286	3, 252, 623	1, 835, 594	4, 337, 750	2, 197, 557

These figures show the enormous increase of 1,085,127 in the receipts, and 351,963 in the shipments. The aggregate value of the receipts of 1873 is estimated at $53,153,000, against $33,500,000 in 1872. Of hog-products the receipts of barreled pork amounted to 40,059 barrels against 121,023 in 1872; shipments, 200,253 barrels against 208,664 the previous year. Of lard the receipts were 21,838,832 pounds against 19,911,797; shipments, 91,999,705 pounds against 86,040,788. Of dressed hogs the number received was 222,457 against 235,905; shipments, 196,429 against 145,701. Of the live hogs received during 1873 the receipts of January averaged 3 pounds heavier than those of the previous January; February showed an average increase of 6 pounds; June of 2½ pounds; August of 2⅜ pounds. The remaining months indicated a decrease, viz: March, 6¼ pounds; April, 12⅛ pounds; May, 6 pounds; July, 2¼ pounds; September, 16¼ pounds; October, 11⅞ pounds; November, 4¾ pounds.

The Chicago Commercial Bulletin gives the following items from the last two packing seasons in that city:

Hogs and hog-products.	1872-'73.	1873-'74.
Live hogs ... cwt.	1, 365, 364	1, 461, 084
Dressed hogs ... do.	59, 715	58, 940
Total	1, 425, 079	1, 520, 024
Average weight per head ... pounds.	236. 25	216. 47
Average yield of lard ... do.	44 02	37. 44
Clear pork ... barrels.	2, 873	1, 840
Mess pork ... do.	88, 337	170, 307
M. O. pork ... do.	780	1, 054
Family pork ... do.	...	2, 852
Prime pork ... do.	8, 726	14, 554
Extra prime pork ... do.	1, 796	4, 514
Rump pork ... do.	426	806

The receipts and shipments of hog-products during the last two seasons were as follows:

Hog-products.	1872-'73.		1873-'74.	
	Receipts.	Shipments.	Receipts.	Shipments
Pork ... barrels.	5, 582	124, 640	35, 967	92, 132
Cut meats ... pounds.	19, 787, 560	160, 557, 414	38, 406, 752	178, 707, 082
Lard ... do.	8, 334, 625	54, 261, 962	12, 873, 112	36, 430, 118

The total movement, in pounds, was as follows:

Years.	Received.	Shipped.
1873-'74	58,273,264	233,563,000
1872-'73	29,234,585	238,747,376
Increase	29,234,679	....
Decrease	....	5,183,776

SAINT LOUIS.

Cattle.—The cattle-trade of Saint Louis exhibits a large increase. The receipts of the past nine years were as follows: 1865, 94,307; 1866, 103,259; 1867, 74,746; 1868, 115,352; 1869, 124,565; 1870, 201,422; 1871, 199,527; 1872, 263,404; 1873, 280,773.

The highest and lowest prices per cental of all grades, for each month of the last three years, were as follows:

Months.	1871.	1872.	1873.
January	$2 50 to $6 25	$2 25 to $5 50	$1 50 to $6 00
February	2 50 to 6 50	3 25 to 5 75	1 50 to 6 00
March	2 75 to 6 50	3 50 to 6 75	1 50 to 6 37½
April	2 75 to 6 50	3 50 to 6 75	1 75 to 6 62½
May	2 62½ to 6 00	4 37½ to 6 50	2 00 to 6 12½
June	3 00 to 6 75	2 50 to 6 50	1 75 to 6 00
July	2 00 to 5 00	1 75 to 6 50	1 75 to 5 60
August	1 75 to 5 00	1 75 to 6 25	1 75 to 6 50
September	1 25 to 4 75	1 75 to 5 75	1 50 to 5 30
October	1 50 to 4 50	1 25 to 6 00	1 40 to 5 00
November	2 25 to 5 00	1 50 to 6 00	1 25 to 5 00
December	1 50 to 4 75	1 37½ to 5 75	1 25 to 5 00

Cattle-products—Butter.—The total receipts of butter in 1873 were 64,607 packages, against 51,259 in 1872. The prices of prime to choice ranged from 14 to 40 cents per pound. The minimum was in June and the maximum in April.

Cheese.—The cheese-trade exhibits a heavy decline, the receipts being 58,790 boxes against 84,345 in 1872. The prices of Ohio factory ranged between 11 cents and 15 cents per pound, the maximum being in January and the minimum in July. Young America ranged from 18 cents to 21 cents per pound, the maximum being in March and April and the minimum in December.

Sheep.—The receipts of sheep for the last nine years were as follows: 1865, 52,133; 1866, 64,047; 1867, 62,974; 1868, 79,315; 1869, 96,326; 1870, 94,477; 1871, 118,899; 1872, 115,904; 1873, 86,370.

The prices per cental at the beginning of each month were as follows: January, $3 to $5; February, $2.75 to $5.50; March, $2.50 to $5.60; April, $2.50 to $5.75; May, $2.75 to $6.50; June, $2.25 to $6.50; July, $1.75 to $5; August, $2.25 to $5; September, $2 to $3.75; October, $1.50 to $2.75; November, $2 to $3.75; December, $2 to $4.

Sheep-products—Wool. The wool-trade in the beginning of the year was quite hopeful and the receipts promised to surpass those of 1872, but a steady and permanent decline in prices discouraged transactions. The receipts in 1870 were 2,700,000 pounds, and in 1871, 4,700,000 pounds; the receipts of 1872 were about equal to those of the previous year; the receipts of 1873, however, did not exceed 3,300,000 pounds. This decline is attributed to the retention in first hands of about a million

and a half pounds of the stock usually marketed at Saint Louis awaiting better prices. The price of unwashed wool reached its maximum in February, 32 to 42 cents per pound, and gradually fell to its minimum in November, 21 to 32 cents per pound; tub-washed ranged from 35 in June to 60 in January; fleece-washed, from 32 in November to 58 in January. The policy of the Saint Louis dealers is to encourage the marketing of unwashed wool.

Hogs.—The annual receipts of hogs for nine years were as follows: 1865, 99,663; 1866, 217,622; 1867, 293,341; 1868, 301,569; 1869, 344,848; 1870, 310,850; 1871, 633,370; 1872, 759,076; 1873, 982,463.

The prices ranged at the beginning of each month of 1873 as follows: January, \$3.25 to \$3.90; February, \$3.40 to \$4.25; March, \$4.40 to \$5; April, \$4.40 to \$5.40; May, \$4.80 to \$5.50; June, \$4 to \$4.50; July, \$4 to \$4.50; August, \$4 to \$4.35; September, \$4 to \$4.50; October, \$3.50 to \$4.25; November, \$3.25 to \$4; December, \$3.70 to \$4.90.

Hog-products.—The receipts of salt pork in 1873 amounted to 57,512 barrels, 7,993 casks and tierces, and 1,588,916 separate pieces, against 60,113 barrels, 8,341 casks and tierces, and 1,327,181 pieces in 1872. Of bacon the receipts of 1873 embraced 10,411 tierces, 5,978 packages, and 110,412 pieces, against 7,774 tierces, 5,716 packages, and 104,623 pieces in 1872. Of lard the receipts of 1873 embrace 22,948 tierces, 6,110 barrels, and 11,714 packages, against 26,174 tierces, 8,017 barrels, and 16,123 packages.

The prices of "standard" pork were quoted at \$11.75 to \$12 per barrel January 4, 1873. They reached the maximum, \$17 to \$17.50, in the last week of May. The last week in December the quotations had fallen to \$14 to \$15. "Irregular" ranged a few cents below.

The prices of lard ranged from 6½ cents to 10¼, the maximum being in May and the minimum in November.

Shoulder-bacon ranged from 5 cents per pound in January to 9½ cents in August and September; clear ribs from 6 cents per pound in November to 10¾ cents in September; clear sides from 6¼ cents in November to 11 cents in August. Of dry salt meats, shoulders were as low as 3¾ cents per pound in January, but rose to 8½ cents in August; clear ribs varied from 5⅜ cents in November to 10 cents in August; clear sides from 5¾ cents in January to 9¾ cents in August.

PORK-PACKING IN THE WEST.

The record kept by the Cincinnati Price-Current shows the number of hogs packed in the West during the last twenty-four packing seasons, as follows: 1849–'50, 1,652,220; 1850–'51, 1,332,867; 1851–'52, 1,182,846; 1852–'53, 2,201,110; 1853–'54, 2,534,770; 1854–'55, 2,124,404; 1855–'56, 2,489,502; 1856–'57, 1,818,486; 1857–'58, 2,210,778; 1858–'59, 2,465,552; 1859–'60, 2,350,822; 1860–'61, 2,155,702; 1861–'62, 2,893,666; 1862–'63, 4,069,520; 1863–'64, 3,261,105; 1864–'65, 2,422,779; 1865–'66, 1,785,955; 1866–'67, 2,490,791; 1867–'68, 2,781,084; 1868–'69, 2,499,873; 1869–'70, 2,635,312; 1870–'71, 3,695,251; 1871–'72, 4,831,558; 1872–'73, 5,410,314; 1873–'74, 5,466,200.

The aggregate of 1873–'74 shows an increase of 55,886 over that of the previous season. To this aggregate should be added 55,000 hogs cut at points not previously reported.

The average weight per head of hogs packed in 1873–'74 was 214.97 pounds, a decrease from the previous season of 17.46 pounds, or 7½ per cent. The aggregate weight shows a loss of 82,392,312 pounds, equal to 354,483 hogs of the standard of 1872–'73. The average yield of lard

per head was 35.02 pounds, a loss of 5.06 pounds or 12⅝ per cent. This decrease is attributed largely to the increased price of hogs, which affects the quantity yielded by the leaf and trimmings. The average cost of hogs per cental, net, was $5.43.15 against $4.65.8 the previous season, an increase of 16.6 per cent.

The number of hogs packed during the season exceeded the largest estimates hazarded during the progress of the season. The indications of declining numbers caused a reaction in prices, which induced many farmers to send to market hogs which would otherwise have been reserved for spring or summer packing. The advance in the price of corn also contributed to swell the number of hogs sent to the winter packing. There is a steady westward gravitation of the pork-packing industry. In Kentucky the raising of hogs appears to be partially superseded by other branches of production, as the number packed in that State was only 257,259, against 332,456 the previous year. Tennessee, Missouri, and Minnesota also show a decline, while Indiana, Illinois, Iowa, Ohio, Wisconsin, Minnesota, Nebraska, Kansas, and Michigan show a greater or less increment.

The following table shows the number packed during the last two seasons:

States.	1872, 73.	1873–'74.	States.	1872–'73.	1873–'74.
Ohio	885, 827	906, 804	Nebraska	20, 110	29, 085
Indiana	610, 966	715, 703	Kentucky	332, 456	257, 259
Illinois	1, 834, 611	1, 887, 328	Tennessee	39, 300	26, 577
Iowa	325, 417	369, 278	Michigan	49, 306	71, 549
Missouri	894, 334	746, 366	Miscellaneous*	28, 450	26, 000
Kansas	40, 885	64, 037			
Wisconsin	324, 072	333, 514	Total	5, 410, 314	5, 466, 200
Minnesota	24, 550	32, 700			

*Including Pittsburgh, Pa., Atlanta, Ga., and for small points in West Virginia.

The average net weight per head and the average net yield of lard per head in these States during the last two packing seasons were as follows:

States.	Average net weight.		Average yield of lard.	
	1872–'73.	1873–'74.	1872–'73.	1873-74.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Ohio	242. 51	233. 49	43. 85	39. 04
Indiana	230. 25	207. 22	33. 80	29. 66
Illinois	239. 21	219. 02	43. 21	37. 23
Iowa	229. 55	204. 67	37. 44	33. 88
Missouri	214. 12	207. 01	36. 03	33. 86
Kansas	244. 18	220. 64	37. 50	35. 83
Wisconsin	230. 45	210. 80	39. 55	30. [illegible]
Minnesota	227. 27	229. 36	39. 36	30. 41
Nebraska	246. 71	214. 65	39. 70	34. 59
Kentucky	225. 84	213. 87	39. 78	29. 66
Tennessee	207. 11	200. 42	31. 21	34. 16
Michigan	237. 94	234. 02	38. 95	38. 26
Miscellaneous	237. 94	207. 04	38. 95	31. 03
General average	232. 43	214. 97	40. 08	35. 02

From the above it will be seen that only one State shows an increased average weight per head. Minnesota enlarged her average by 2.09 pounds. The other States show declining averages, as follows: Michigan, 3.92 pounds; Tennessee, 6.69; Missouri, 7.11; Ohio, 9.02; Ken-

tucky, 11.97; Illinois, 20.19; Indiana, 23.03; Kansas, 23.54; Iowa, 24.88; Wisconsin, 29.56; miscellaneous, 30; Nebraska, 32.06. This general reduction of averages may be attributed to a cause already cited, the marketing of imperfectly fattened hogs under the double pressure of higher prices and the monetary crisis.

In the average yield per head of lard the only increase, 2.95 pounds, is shown by Tennessee. The smallest decrease, .69 pounds, was in Michigan. Next in order were Kansas, 1.67; Missouri, 2.17; Minnesota, 2.95; Iowa, 3.56; Indiana, 4.23; Ohio, 4.81; Nebraska, 5.11; Illinois, 5.98; miscellaneous, 7.92; Wisconsin, 9.05; Kentucky, 10.12.

The average cost of hogs per cental during the last two packing seasons was as follows:

States.	1872-'73.	1873-'74.	States.	1872-'73.	1873-'74.
Ohio	$4 82.59	$5 57.24	Nebraska	$3 70	$4 64.17
Indiana	4 43.96	5 29.63	Kentucky	4 88	5 54.45
Illinois	4 67.1	5 43.25	Tennessee	5 13.5	5 72.23
Iowa	4 31.29	5 19.03	Michigan	4 94.2	5 54.30
Missouri	4 63.3	5 36.63	Miscellaneous	4 94.2	5 88.10
Kansas	4 01.1	4 77.58			
Wisconsin	4 72.48	5 72.16	General average	4 65.8	5 43.15
Minnesota	4 81	5 68.52			

The number of hogs packed at six principal points compared with all the others, during the last two packing seasons, is as follows:

Packing points.	1872-'73.	1873-'74.
Chicago	1,425,079	1,520,204
Cincinnati	626,305	581,253
Saint Louis	538,000	463,793
Indianapolis	196,317	295,766
Milwaukee	303,500	294,054
Louisville	302,246	226,947
	3,391,447	3,381,837
Other points	2,018,867	2,084,363
Total	5,410,314	5,466,200
Percentage of the six cities to the whole	62.68	61.87

Increase of numbers at interior points	65,496
Decrease at the six principal points	9,610
Net increase of the whole	55,886

The only one of the six principal points that shows an increase is Chicago.

The aggregate net weight and yield of lard per head during the last two seasons were as follows:

Packing seasons.	Net weight.	Lard.
1872-'73 ... pounds	1,257,519,283	216,845,385
1873-'74 ... do	1,175,126,971	191,444,035
Decrease ... do	82,392,312	25,401,350

Summer packing.—An increase of summer packing is noted at several points, especially at Cincinnati. The following are the approximate numbers of hogs slaughtered at various points in the West: Ohio,

216,676; Indiana, 284,868; Illinois, 274,500; Iowa, 88,183; Kansas, 2,500; Michigan, 13,500; Minnesota, 3,000; Missouri, 149,155; Wisconsin, 500. Total, 1,030,884, against 495,714 the previous summer packing.

PORK-PACKING IN THE EASTERN CITIES.

During the last few years the eastern cities have engaged to an increasing extent in pork-packing, as will be seen from the following statistics, compiled by Sidney D. Maxwell, superintendent of the Cincinnati Merchants' Exchange:

RECEIPTS AT THE SEABOARD CITIES.

Summer.

	March 1 to November 1, 1872.		March 1 to November 1, 1873.	
	Number.	Total.	Number.	Total.
New York, live	1,231,794		1,250,960	
dressed	11,177	1,258,414	7,454	1,242,971
Boston, live	363,210		475,795	
dressed	16,339	379,549	6,112	481,907
Philadelphia, live	235,000		187,374	
dressed	70,000	305,000	51,317	238,691
Baltimore, live	170,000		267,739	
dressed	....	170,000	....	267,739
Total summer packing	....	2,112,963	....	2,231,308

Winter.

	Nov. 1, 1872, to March 1, 1873.		Nov. 1, 1873, to March 1, 1874.	
	Number.	Total.	Number.	Total.
New York, live	728,636		703,362	
dressed	87,488	816,124	121,718	824,980
Boston, live	299,927		422,418	
dressed	68,189	368,116	54,565	476,883
Philadelphia, live	117,000		118,316	
dressed	37,000	154,000	84,717	203,033
Baltimore, live	176,000		144,996	
dressed	....	176,000	....	144,996
Total winter packing	....	1,514,240	....	1,649,892
Total summer packing	....	2,192,963	....	2,231,308
Grand total for the year	....	3,707,203	....	3,881,200

FOREIGN COMMERCE OF FOREIGN STATES.

RUSSIAN FOREIGN TRADE.

Exports and imports of 1872.

Countries.	Value of exports.	Value of imports.
Great Britain	£24,294,393	£18, 268, 578
Prussia	9, 674, 925	17, 996, 795
France	4, 878, 096	2, 731, 988
Austria	2, 018, 506	1, 480, 301
Turkey	1, 365, 546	1, 265, 068
German States other than Prussia	898, 993	212, 455
Moldavia and Wallachia	440, 449	442, 177
Holland	1, 199, 524	850, 168
Hanseatic Towns	293, 869	1, 279, 768
Belgium	1, 038, 640	902, 608
Italy	1, 245, 136	939, 276
Sweden and Norway	539, 336	500, 960
United States	135, 598	707, 331
Portugal	108, 638	42, 951
Greece	335, 957	336, 105
Spain	55, 865	249, 142
South America	....	43, 443
Other countries	71, 399	224, 868
Total	48, 978, 951	45, 501, 476

The rapid extension of the railway system of Russia has stimulated greatly both the home and foreign trade of the empire. The rate of progress is indicated by the following statement:

Years.	Miles.	Years.	Miles.	Years.	Miles.
1851	625	1861	1,310	1866	2,889
1853	653	1862	2,114	1867	3,191
1857	728	1863	2,245	1868	4,374
1859	833	1864	2,305	1869	5,169
1860	993	1865	2,443	1870	7,011

BRITISH FOREIGN TRADE.

Value of total imports and exports of the United Kingdom of Great Britain.

Years.	IMPORTS.		EXPORTS.				TOTAL OF IMPORTS AND EXPORTS.	
			British produce.					
	Total value.	Proportion per head of population of United Kingdom.	Total value.	Proportion per head of population of United Kingdom.	Foreign and colonial produce.	Total value of British and foreign and colonial produce.	Total value.	Proportion per head of population of United Kingdom.
		£ s. d.		£ s. d.				£ s. d.
1858	£164, 583, 832	5 16 0	£116, 608, 756	4 2 5	£23, 174, 023	£139, 782, 779	£304, 366, 611	10 14 5
1859	179, 182, 355	6 5 5	130, 411, 529	4 11 2	25, 281, 446	155, 692, 975	334, 875, 330	11 14 2
1860	210, 530, 873	7 7 0	135, 891, 227	4 14 7	28, 630, 124	164, 521, 351	375, 052, 224	13 0 7
1861	217, 485, 024	7 10 2	125, 102, 814	4 6 5	34, 529, 684	159, 632, 498	377, 117, 522	13 0 5
1862	225, 716, 976	7 14 7	123, 992, 264	4 5 7	42, 175, 870	166, 168, 134	391, 885, 110	13 8 5
1863	248, 919, 020	8 9 5	146, 602, 342	5 0 0	50, 300, 067	196, 902, 409	445, 821, 429	15 3 5
1864	274, 952, 172	9 5 7	160, 449, 053	5 8 4	52, 170, 561	212, 619, 614	487, 571, 786	16 9 0
1865	271, 072, 285	9 1 7	165, 835, 725	5 11 1	52, 995, 851	218, 831, 576	489, 903, 861	16 8 2
1866	295, 290, 274	9 13 4	188, 917, 536	6 5 7	49, 988, 146	238, 905, 682	534, 195, 956	17 15 2
1867	275, 183, 137	9 1 5	180, 961, 923	5 19 4	44, 840, 606	225, 802, 529	500, 985, 666	16 10 3
1868	294, 693, 608	9 12 10	179, 677, 812	5 17 4	48, 100, 642	227, 778, 454	522, 472, 062	17 1 3
1869	295, 460, 214	9 11 2	189, 953, 957	6 2 7	47, 061, 095	237, 015, 052	532, 475, 266	17 4 6
1870	303, 257, 493	9 14 4	199, 586, 822	6 7 11	44, 493, 755	244, 080, 577	547, 338, 070	17 10 10
1871	331, 015, 480	10 10 1	223, 066, 162	7 1 7	60, 508, 538	283, 574, 700	614, 590, 180	19 10 1
1872	354, 693, 624	11 2 10	256, 257, 347	8 1 0	58, 331, 487	314, 588, 834	669, 282, 458	21 0 6

Quantities of principal imports and exports for three years.

Articles.	1868.	1869.	1870.
IMPORTS.			
Raw cotton ... cwts.	761, 376	944, 011	827, 247
Coal ... tons.	559, 857	609, 096	639, 847
Tea ... pounds, English.	18, 339, 804	20, 408, 451	19, 307, 947
Coffee ... do.	11, 304, 107	16, 592, 498	15, 667, 235
Unwrought metals ... tons.	158, 506	294, 841	345, 168
Herrings ... barrels.	459, 378	342, 552	362, 311
Sugar ... cwts.	28, 293	24, 250	7, 393
Tobacco ... do.	39, 990	60, 149	56, 191
Coloring matters ... do.	358, 933	876, 149	1, 069, 558
Cotton-yarn ... pounds, English.	4, 968, 747	5, 865, 671	7, 279, 767
Cotton manufactures ... cwts.	16, 290	25, 659	24, 563
Woolen manufactures ... do.	23, 684	38, 711	38, 876
Blacksmiths' work—axles, hoops, iron chains, &c ... tons.	36, 303	64, 309	39, 711
Machinery, locomotives, and other railway apparatus* ... do.	(*)	30, 537	39, 511
EXPORTS.			
Total of grain of all sorts ... quarters.	8, 563, 168	14, 234, 070	14, 667, 500
Wheat ... do.	4, 841, 900	4, 564, 026	6, 917, 368
Oats ... do.	1, 599, 095	1, 088, 212	2, 928, 636
Linseed ... do.	1, 967, 990	1, 949, 802	1, 707, 068
Flax ... tons.	115, 199	94, 826	164, 785
Hemp ... do.	42, 853	49, 669	52, 145
Tallow ... do.	38, 729	25, 670	21, 111
Wool ... do.	15, 334	15, 382	14, 746
Bristles ... do.	1, 436	1, 420	1, 367

* Partly introduced free of duty this year.

FRENCH EXPORTS.

Value of exports from France for the years 1863–'72, inclusive.

Years.	Manufactures.	Food and raw material.	Miscellaneous.
1872	£82, 233, 000	£57, 650, 200	£7, 277, 080
1871	64, 836, 440	44, 420, 880	5, 267, 200
1870	61, 352, 760	46, 024, 760	4, 716, 440
1869	70, 252, 800	47, 426, 680	5, 318, 160
1868	63, 084, 600	43, 897, 480	4, 614, 480
1867	65, 242, 680	43, 592, 360	4, 201, 360
1866	72, 798, 560	50, 513, 640	3, 922, 960
1865	71, 660, 840	48, 025, 520	3, 848, 640
1864	72, 379, 880	41, 009, 720	3, 577, 120
1863	63, 778, 440	38, 584, 040	3, 339, 880

Articles.	1872.	1871.	Increase.
Tissues, wool	£11, 618, 400	£10, 174, 640	£1, 443, 760
cotton	2, 769, 720	2, 200, 960	568, 760
hemp and flax	913, 120	744, 040	169, 080
Alpaca and jute twists	136, 200	74, 320	61, 880
Hemp and flax twists	380, 360	271, 720	108, 640
Cured hides	4, 004, 360	2, 442, 240	1, 562, 120
Leather articles	5, 006, 040	3, 426, 560	1, 579, 480
Felt hats	585, 440	334, 360	251, 080
Cords, (hemp)	134, 160	112, 480	21, 680
Jewelry	1, 507, 800	993, 160	514, 640
Clocks and watches	610, 080	369, 240	250, 840
Machines	1, 079, 680	612, 920	466, 760
Tools	2, 902, 520	1, 560, 760	1, 341, 760
Carriages	404, 200	100, 160	304, 040
Artificial flowers	1, 410, 680	786, 560	624, 120
Furniture	1, 114, 200	978, 120	136, 080
Scientific instruments	235, 480	125, 200	110, 280
Musical instruments	459, 240	283, 160	176, 080
Ready-made clothes	4, 290, 160	2, 834, 400	1, 455, 760
Articles from Paris	312, 120	142, 480	169, 640
Books and prints	837, 120	650, 040	187, 080

AUSTRIAN EXPORTS.

The foreign trade of Austria is thus officially reported:

	Florins.
Value of imports, 1871	525, 737, 301
Value of exports, 1871	498, 560, 123
Value of imports, 1870	421, 588, 651
Value of exports, 1870	391, 477, 645

Value of items of export.

Articles.	1871.	1870.
	Florins.	*Florins.*
Colonial produce and southern fruits	26, 339, 738	17, 432, 328
Tobacco	13, 870, 730	3, 721, 830
Garden-produce, &c	86, 815, 583	65, 228, 067
Cattle	10, 881, 143	10, 403, 624
Animal-products	10, 921, 073	9, 402, 080
Grease	7, 757, 745	11, 005, 747
Drinks and eatables, (comestibles)	6, 483, 833	8, 414, 331
Combustibles and building materials	54, 132, 451	8, 414, 331
Drugs, perfumery, chemical products, dyeing and tanning stuffs	5, 075, 217	5, 267, 358
Metals	4, 296, 957	5, 021, 394
Woven stuffs, tissues, wrought, &c	45, 962, 115	32, 353, 611
Thread	11, 427, 259	9, 821, 766
Materials for tissues and wrought and made-up stuffs	61, 326, 887	56, 238, 813
Brushes, straw, dung, herbs, paper	10, 019, 439	7, 878, 702
Hides and skins	18, 096, 128	14, 478, 507
Wood, glass, pottery, &c	28, 512, 646	26, 105, 726
Metal-work	14, 728, 417	12, 649, 046
Locomotive machinery for sea and land	5, 717, 175	6, 655, 160
Instruments, machines, &c	63, 733, 063	46, 740, 477
Chemical products, greasy matters, matches	7, 117, 726	6, 751, 072
Literary and artistic articles	4, 002, 045	3, 493, 195
Refuse, (déchets)	1, 282, 753	1, 862, 841

SWEDISH FOREIGN TRADE.

Swedish trade in certain agricultural products.

Articles.	1866.	1867.	1868.	1869.	1870.
EXPORTS.					
Oats .... cubic feet.	10, 143, 900	15, 355, 440	8, 600, 650	11, 155, 606	20, 161, 920
Wheat .... do.	109, 636	110, 427	07, 242	1, 007	236, 613
Barley .... do.	1, 532, 460	332, 917	...	1, 055, 892	2, 432, 276
Vetches .... do.	...	496	...	...	2, 831
Peaso .... do.	482	...	...	...	33, 527
Horses .... number.	1, 105	1, 127	1, 011	674	...
Cattle .... do.	14, 566	18, 112	16, 405	13, 952	12, 988
Sheep .... do.	8, 777	5, 711	7, 395	8, 185	8, 560
Swine .... do.	8, 193	3, 241	2, 726	10, 329	15, 907
Birds .... do.	...	...	4, 255	7, 380	15, 347
Eggs .... do.	239, 780	155, 820	370, 973	1, 120, 310	1, 638, 559
Butter .... centner.	...	...	27	...	7, 279
IMPORTS.					
Barley .... cubic foot.	...	...	59, 116	...	...
Rye .... do.	1, 186, 066	3, 085, 063	4, 771, 875	3, 895, 875	525, 532
Vetches .... do.	6, 261	...	18, 546	21, 142	...
Pease .... do.	...	57, 073	280, 657	142, 911	...
Medin .... do.	11, 311	19, 455	...	...	60, 545
Flour and grit .... centner.	354, 328	1, 191, 367	897, 212	988, 554	761, 701
Horses .... number.	...	...	...	...	562
Butter .... centner.	15, 161	10, 976	...	4, 152	...
Cheese .... do.	7, 883	4, 045	5, 312	6, 079	3, 948
Meat and bacon .... do.	12, 407	23, 701	22, 430	32, 871	38, 726

Exports from Sweden for 1871.

Articles.		Quantity.	Value.
			Rigsdaler.
Brandy and spirits	kannor	7,221	5,054
Butter	cwt	68,321	3,406,050
Cereals	cubic feet	24,005,038	30,661,534
Copper	cwt	25,343	1,774,010
Eggs	piece	1,943,250	58,297
Fish	cwt	1,258	9,435
Hides, including furs	do	10,796	722,575
Iron	do	5,158,817	36,877,437
Lobsters	piece	56,509	8,476
Lead	cwt	2,688	40,320
Matches	lbs	8,351,028	2,087,757
Ore	cwt	279,843	139,921
Oil-cake	do	48,656	255,444
Pitch	do	4,039	28,273
Seed	lbs	384,411	172,984
Stone			253,137
Steel	cwt	125,775	1,572,587
Tar	do	242,246	726,738
Timber	cubic feet	111,950,958	57,682,081
Wares not specified			568,803
Wares re-exported			15,425,249
Total value			152,485,768

The value of exports to the British United Kingdom, £4,058,870, was nearly one-half the total value, £8,471,432.

EXPORTS FROM BRAZIL.

Sugar.

1866-'67	117,704,813 kilograms	=	259,508,156 pounds.
1868	129,091,985		284,613,876
1869	130,065,335		286,759,857
1870	133,263,920		293,811,895
1871	135,315,318		298,334,688

Tobacco.

1866-'67	14,837,412 kilograms	=	32,712,591 pounds.
1868	13,746,665		30,307,781
1869	11,692,933		25,779,842
1870	15,208,071		33,529,797
1871	16,217,227		35,774,720

Coffee.

1866-'67	189,386,362 kilograms	=	417,547,320 pounds.
1867-'68	213,640,938		471,255,181
1868-'69	238,041,051		524,816,921
1869-'70	186,838,237		411,805,244
1870-'71	229,590,341		506,176,218

Caoutchouc.

1866-'67	4,720,881 kilograms	=	10,408,301 pounds.
1867-'68	4,956,127		10,926,957
1868-'69	4,661,225		10,276,775
1869-'70	4,779,411		10,537,344
1870-'71	4,798,321		10,579,036

FARM STATISTICS OF GREAT BRITAIN.

Popular rumor made the British wheat-crop of 1873 much smaller in area than usual, even reducing it 20 per cent., but the official returns (which are an actual census) made the reduction only 3 per cent. The number of occupiers of land returned was 567,187. Ireland has about the same number. The average extent of land for each holding was 56 acres in England, 46 in Wales, 56 in Scotland, 39 in the Isle of Man, 9 in Jersey, 6 in Guernsey, and 26 in Ireland. There are about 50,000 allotments (of one-fourth of an acre to one acre) to laborers in England, and, including those of smaller extent, 246,000, and in Wales 1,700, and 2,100 in Scotland. The number of acres in such allotments aggregates 59,631.

In Ireland 1,930,800 acres, or 36.5 per cent. of the cultivated land, were in cereals; 1,372,500 acres, or 26 per cent., in green crops including potatoes; 1,837,500, or 34.8 per cent., in grass under rotation; 129,432, or 2.4 per cent., in flax; and 13,474 acres, or 3 per cent., in bare fallow.

There is an increase in both cattle and sheep. The stock of cattle has also increased in Ireland. The dry seasons, 1870 and 1871, caused a reduction of sheep to the extent of two and a half million head. The numbers have been very nearly made good.

Population, area, acreage under crops, and live-stock of the United Kingdom.

	Years.	England.	Scotland.	Ireland.	United Kingdom.
Total population	1871	21, 495, 131	3, 360, 018	5, 411, 416	31, 628, 338
Total area in statute acres	......	32, 597, 398	19, 496, 132	20, 819, 829	77, 828, 829
Acreage under all kinds of crops, bare, fallow, and grass.	1872	23, 830, 197	4, 538, 334	15, 746, 547	46, 869, 326
	1873	23, 893, 558	4, 561, 982	15, 704, 328	46, 926, 917
Acreage under corn-crop, including beans and pease.	1872	7, 576, 698	1, 434, 937	2, 090, 673	11, 698, 245
	1873	7, 501, 713	1, 420, 429	1, 930, 824	11, 422, 532
Acreage under green crops	1872	2, 778, 925	701, 903	1, 473, 916	5, 111, 994
	1873	2, 749, 318	693, 936	1, 372, 420	4, 971, 112
Acreage under bare fallow	1872	585, 417	27, 639	18, 512	667, 299
	1873	649, 374	22, 394	13, 474	720, 990
Acreage under grass, clover, &c., under rotation.	1872	2, 822, 392	1, 320, 209	1, 790, 930	6, 354, 319
	1873	2, 678, 311	1, 327, 952	1, 837, 483	6, 240, 900
Acreage permanent pasture	1872	9, 990, 828	1, 052, 894	10, 241, 513	22, 838, 178
	1873	10, 237, 814	1, 096, 530	10, 420, 695	23, 363, 990
Percentage of acreage under corn-crops, including beans and pease.	1872	31. 8	31. 6	13. 3	25. 0
	1873	31. 4	31. 1	12. 3	24. 3
Percentage of acreage under green crops	1872	11. 6	15. 5	9. 4	10. 9
	1873	11. 5	15. 2	8. 7	10. 6
Percentage of acreage under bare fallow	1872	2. 4	. 6	. 1	1. 4
	1873	2. 7	. 5	. 1	1. 5
Percentage of acreage under grass, clover, &c., under rotation.	1872	11. 9	29. 1	11. 4	13. 6
	1873	11. 2	29. 1	11. 7	13. 3
Percentage of acreage under permanent pasture.	1872	42. 0	23. 2	65. 1	48. 7
	1873	42. 8	24. 0	66. 4	49. 8
Acreage of orchards, including arable or grass lands used also for fruit-trees	1873	143, 295	1, 874	....	....
Acreage of woods, coppices, and plantations	1873	1, 325, 765	734, 400	325, 173	....
Numbers of live-stock:					
Horses	1872	962, 548	177, 206	540, 745	1, 808, 259
	1873	979, 012	177, 159	531, 708	1, 817, 831
Cattle	1872	3, 901, 663	1, 120, 593	4, 057, 153	9, 718, 504
	1873	4, 173, 635	1, 148, 057	4, 151, 561	10, 153, 670
Sheep	1872	17, 912, 904	7, 141, 459	4, 202, 117	32, 246, 642
	1873	19, 169, 851	7, 290, 922	4, 486, 453	33, 982, 404
Pigs	1872	2, 347, 512	185, 920	1, 385, 386	4, 178, 000
	1873	2, 141, 417	147, 668	1, 044, 218	3, 563, 532
Number to every 100 acres under crops, fallow, and grass:					
Horses	1872	4. 0	3. 9	3. 4	3. 9
	1873	4. 1	3. 9	3. 4	3. 9
Cattle	1872	16. 4	24. 7	25. 8	20. 7
	1873	17. 5	25. 2	26. 4	21. 6
Sheep	1872	75. 2	157. 4	27. 1	68. 8
	1873	80. 2	159. 8	28. 6	72. 4
Pigs	1872	9. 9	4. 1	8. 8	8. 6
	1873	9. 0	3. 2	6. 6	7. 9

ADDENDA TO STATISTICAL REPORT.*

PRACTICAL HINTS FROM AGRICULTURAL STATISTICS.

The members of the National Agricultural Congress too thoroughly appreciate the importance of a systematic collection of the facts of agriculture, which necessarily include those illustrating almost every branch of natural and social science, to require an elaborate argument to prove the utility and beneficence of agricultural statistics. The range of such facts is quite too wide for bodily presentation, in however concise a form, in the time allotted to the opening of this discussion. Nor is such epitome especially required in this presence. Rather would it seem preferable to present a few deductions drawn from classes of facts, designed to be eminently practical in tendency, suggestive of grand schemes of needed improvement, perhaps provocative of wholesome criticism and stimulative of thought and suggestion for the amelioration and advancement of American agriculture. A brief consideration of the means and appliances of statistical collection may also be deemed appropriate and timely.

USES OF AGRICULTURAL STATISTICS.

It is the province of agricultural statistics to measure the extent of our vast resources; to contrast the actual with the possible in production, by living examples of accomplished results; to weigh the effect of overproduction in the diminution of prices; to illustrate the folly of dependence on distant and uncertain markets for primary products; to show the correlation of the industries, and the advantage of augmenting numbers of consumers upon the prices and profits of agriculture; and to mark the progress of the sciences in their application to the business of the cultivator, and to aid the ruralist in keeping pace with such progress.

There is great activity of statistical inquiry at the present time, and but little patience of investigation; there is frequency and flippancy in statement, but less of accuracy and thoroughness. There is a feverish desire to accomplish the census of a continent in one day, and proclaim its results the next. Few take time to weigh facts, sift error from truth, and reach broad and philosophical conclusions. What is wanted in statistics is more of thought and less of flurry, more industry and less precipitancy, sounder judgment and less zeal without knowledge. Few have yet learned the logic of statistics, and some even of our lawgivers are prone to build by proxy the framework of their political economy, and liable to give it a fantastic and incongruous finish.

THE BREADTH OF OUR STATISTICAL FIELD.

When we consider that less than a third of the area of the States, and less than a fifth of the entire domain of the United States, is mapped into farms, and remember that of this farm-area only one-fourth is tilled or mowed; and when we further reflect that the average yield per acre could be doubled if the many could be brought up to the plane of the few in the practice of intensive culture, then we begin to realize what numbers our country is capable of feeding, and what waste of toil and effort comes from neglect of the economical lessons taught by the statistics of scientific agriculture.

We now know that our wheat occupies an area less than the surface of South Carolina; and, if the yield should equal that of England, half of that acreage would suffice We know of our national crop, maize, which grows from Oregon to Florida, and yearly waves over a broader field than all the cereals beside, that it covers a territory not larger than the Old Dominion, and might produce its amplest stores within narrower limits than the present boundaries of Virginia. The potato-crop could grow in the area of Delaware, though yielding less than a hundred bushels per acre; the barley for our brewing requires less than the area of a half-dozen counties; and the weed of solace, sufficient to glut our own and European markets, is grown on the area of a county twenty miles square.

STATISTICAL TEST OF CURRENT PRACTICES.

The dictum of the poet, "Whatever is, is right," must have in agriculture, as in morals, a restricted acceptation. The prevailing practice may have an obvious and even a specious reason for its existence, when its contravention by science and experimental test is undeniable. We often fail to do what we know is best, because custom has made easy what has become habitual. The deductions of agricultural statistics reveal many a popular error or short-coming in agricultural practice. Perhaps I may not better illustrate the province and proper use of this science than by a few examples showing the prevalence of such misconception and remissness in different sections of our common country.

*Being an address delivered by the Statistician, partly in explanation of the statistical operations of this Department, at the National Agricultural Congress, at Atlanta, Georgia, May 14, 1874.

THE WEAK POINT IN NEW ENGLAND AGRICULTURE.

The average farmer of the Eastern States disregards the logic of facts which reveals success only in high culture. His brother of the West has cheap lands, very fertile, easily worked, without obstructions interfering with the most varied employment of agricultural machinery. His own lands may be low in price, because poor in plant-food; his sons have gone into trade and manufactures, and to virgin soils toward the sunset; his surplus earnings have gone to the savings-bank, or to Illinois or Kansas, as a loan at 10 per cent., until, rheumatic, and declining with age, he finds production also declining, his herds and flocks decreasing, and the conclusion inevitable that "farming does not pay." Labor is scarce and high because in demand by other industries, which in turn offer high prices for farm-products; fertilization is needed everywhere, draining in many situations, and irrigation in some others. But these things cost money, and he has neither the ambition nor the confidence for its expenditure, and, worse still, in many instances the money is lacking. These may be potent reasons for discouragement, but they do not prove that farming there, with money, youth, enterprise, and skill, may not be highly profitable. And the teaching of statistics, in examples of high success with high culture, disproves the current assumption of unprofitableness. There are numerous cases in which the gross return per acre has been hundreds of dollars instead of tens. I know an instance there in which a common vegetable, usually known in field-culture rather than in gardening, returned in 1873 $12 for every day's labor expended on it. The lesson of statistics of Great Britain, of Holland, of all countries of dense population, proves success to be only possible by enriching the soil and increasing the yield. Though Massachusetts farmers constitute but one-eighth of the aggregate of all occupations, there is no reason why they should not be able to feed all, if Great Britain with one-sixteenth of her population can furnish more than half her required food-supplies. And if, in the present state of Massachusetts agriculture, the value of her annual product be $442 to each farmer, while the cultivator of the rich prairie State, Illinois, earns but $560, (and in point of fact it is probable that unenumerated products of the former State would swell the total to the latter figures,) then the results of intensive culture throughout the Commonwealth would be comparatively munificent. This is a valuable lesson which New England will ultimately learn from statistics, far more thoroughly than is now known and practiced by a few of her best cultivators.

A WESTERN FALLACY.

The West has also much to gain from the teachings of statistics. Iowa, vigorous and ambitious, too young for despondency, is in a spasm of indignation against monopoly and an excess of middlemen, and yet in trade and transportation she has but 8 per cent., or little more than half the proportion of the Middle States. She may have too many and too greedy go-betweens, and she needs justice in the transportation of her products; but these evils remedied, the burden of her trouble would still remain. The great difficulty is, *her corps of industry has* 61 *per cent. of farmers instead of* 25. Double-track railroads, canals vexed with steam-propellers, grange-association, free-trade, and every other fancied boon obtained, she will still remain in comparative poverty and positive discontent while she continues to have less than 14 per cent. of her people engaged in manufacturing and mechanical industry. History does not point to a permanently prosperous people having such preponderance of population in agricultural pursuits.

FOLLY OF FOREIGN DEPENDENCE.

Minnesota is only happy when the people of Great Britain are supposed to be in danger of starvation. That danger is greatly overestimated. Statistics will show that in some years but 3 per cent. of our wheat-export, and but a trifling proportion in any season, can be sold to any except subjects of Great Britain. On one-sixteenth the area of that island is grown in a good year one hundred million bushels of wheat; in an average season ninety millions; and in fifteen years, from 1858 to 1872 inclusive, the deficiency made good by importation was a fraction less than sixty-six millions per annum. Could home-culture be extended to meet this demand, the total breadth required would be equal to one-ninth the surface of Minnesota. An increase in the average yield of wheat in France from fifteen bushels to eighteen, by a small advance in culture, would fully equal the British deficiency, as was recently stated by the well-known statistician, Mr. James Caird. Russia, with her broad and cheap acres, also stands near to compete for this deficiency. Minnesota, meanwhile, as her crop is maturing, can never ascertain whether the want will be forty millions or ninety, or whether the home price will be 50 cents or $1, or the ultimate result debt or competence. And yet 70 per cent. of the cultivated area of Minnesota is put in wheat, and 57 per cent. of her people are engaged in its cultivation; 8 per cent. in sending it to market; a large proportion of its 14 per cent. of mechanics and manufacturers are building mills and grinding wheat; and its 21 per cent. of professional men expect much of their income from wheat. There are reasons

why wheat should be temporarily grown there, but dependence upon foreign markets, evidently felt by many, for a permanent and increasing demand, is shown by statistics to be foolish and futile. The home-market is the only reliable and permanently valuable one for this cereal, and the nearer to the place of growth the surer and larger the benefit derived.

THE ERROR OF THE SOUTH.

The cotton States have been especially persistent in disregarding the teachings of statistics and defying the laws of political economy. Every intelligent publicist knows that a certain amount of money, say a present average of $300,000,000, may be derived from cotton. If the average quantity is increased the price diminishes, and *vice versa*. If fluctuations are frequent the speculator or manufacturer, and not the producer, derives an advantage. If you choose to produce five million bales, you obtain 10 cents per pound and lose money; if you grow but three, you get 20 cents and obtain a profit. Now it is better for the world, and in a series of years better for the grower, to produce regularly enough to supply the current wants of the trade at a medium and remunerative price, or as near a regular supply as possible, for the vicissitudes of the season will inevitably cause injurious fluctuations despite the highest effort of human wisdom and foresight. As the uses of cotton increase, and markets are extended throughout the world, its manufacture will be enlarged, and its culture should obtain corresponding enlargement. To overstop the boundary of current demand and glut the market, may be pleasing to the speculator and to the manufacturer, so far as he combines speculation with weaving, but it is death to the grower.

There is much false reasoning on this matter. A planter may truly affirm that he obtains $30 per acre for his cotton and but $25 for his corn, and he thereupon and therefore declares that he will plant no more corn. Let all act upon this suggestion, and instead of $55 for the acre of cotton and that of corn, the total return of the two acres of cotton will be but $30. A surplus of corn may be put into meat, and wool, and whisky, or used to eke out a scarcity of some kind of forage for animals; but a surplus of cotton must wait for the slow grinding of the mills of the fabricating gods, usually until disgust at low prices reduces production correspondingly.

Thus, while cotton is and long will be the leading product and the most profitable field-crop at fair prices, its prominence in the list has kept and is now keeping these States in comparative poverty, which is unnecessary as it is inconvenient and injurious. It does not produce money enough to give wealth to a population of nine millions. The other crops, instead of barely equaling in the aggregate the receipts from this, should represent at least $4 for every one of cotton. The census-record of production in these States is but $558,000,000; the record should be made to read $1,500,000,000. With three-fourths of the people of ten States employed in agriculture, the value of agricultural products exceeds but little that of the States of New York and Pennsylvania, where only one-fourth are so employed. The averages for each person employed in agriculture in those States are respectively, as deduced from the census, $677 and $707, while those of Georgia and Mississippi are $239 and $282. For the ten States the average is $267; for the four populous Middle States, $686. Even the States producing cheap corn show a larger return, the average for one man's labor in the five States between the Ohio River and the lakes being $498, while the six sterile Eastern States produce $490 for each farmer. It may be the census is less complete in the cotton States, but it is undeniable that agricultural industry makes a smaller aggregate return there than in any other section. Nor is the reason wanting; it is due to the prominence of cotton, the return for which is substantially a fixed quantity, and the neglect of all other resources.

Let us glance at the topography and capabilities of this section. The area occupied by cotton, allowing 10 per cent. addition to usual estimates, is less than one-fortieth of the surface of these States; it is but one-thirteenth of the proportion actually occupied as farms. Forty-six per cent. of the census crop was grown in 81 counties, which are all that produce as much as ten thousand bales each; and 77 per cent. grew in 215 counties, making not less than five bales each. The total acreage in cotton is scarcely more than one-sixteenth of the surface of Texas. What is to be done with the other fifteen-sixteenths? A very large proportion of the area of these States is unadapted to cotton, either by reason of elevation or of soil.

There is no other section of the country with resources so varied; none presenting such a field for new and promising enterprises. Competition is possible with the sea-islands in oranges and bananas and other fruits in Florida, and with New York and Michigan in apples and other fruits, on the table-lands of the Alleghanies. More than half the value of all cotton-exports is paid for imports of sugar, which could and should all be grown in these States. But one pound in ten of the required supply is now made, upon a smaller surface than half of a single county twenty miles square. The demand of the world for oils—cotton, rape, *palma-christi*, and many other—is large, and prices are remunerative, and this section is peculiarly adapted to their production. A hundred million pounds of cheese, to compete with an equal quantity in New York, without danger of glutting the market, could be made from grasses of the glades that grow on lands costing one-twentieth the value of Empire State pastures. More

than two hundred millions of acres of these States are covered with wood, and the ax is still brought into requisition to girdle the monarchs of the forest, and await a slow decay for replacing fields worn out by a wasteful culture, while a timber-famine threatens other sections of the country, and a thousand forms of woody fabrication can readily be transmuted into gold—at least into greenbacks, which seem to be preferred to gold in certain districts. Even the forest-lands, certainly those of the coast-belt, are covered with wild grasses, only partially utilized, which, in connection with the herbage of the prairie sections, are worth, in flesh and wool, at a meager estimate, half the value of the cotton-crop. The list might be increased indefinitely. With the introduction of the best machinery, the most economical methods, and the most efficient means of fertilization, with well-directed and persistent labor, adapted to the wants of all classes of workers, the present population is amply sufficient to double the gross product of agricultural industry, and far more than double its profits.

SOUTHERN MANUFACTURING.

I have hitherto only spoken of agricultural industry. The suggestions relative to the necessity of other productive industries in the West apply with augmented force to the South. While the proportion engaged in them ranges from 14 per cent. in Iowa to 24 in Ohio, it only runs from 3 per cent. in Mississippi to 6 per cent. in Georgia. The intelligent planter of Georgia knows perfectly well, by the test of local experience, that the manufacture of cotton in his State is far more remunerative than the same business in Massachusetts, not only on account of saving freights and commissions both on raw material and manufactured goods, but in the greater abundance and cheapness of labor. It might be considered a fair division of the crop, and certainly a generous one on the part of the South, to keep one-third for home manufacture, to send a third to the North for manufacture into finer goods, and the remaining third to Europe. This would insure a steady and imperative demand, and a great enlargement of net profits. If you can do this without a tariff, you can afford to let the tariff slide; if not, far better for twenty years a tariff utterly prohibitory of all cottons than to forego this opportunity to make the country prosperous and rich beyond your present imaginings.

There is no good reason why Virginia should not equal Pennsylvania in manufacturing and mining production, as she ever does in resources of mine and forest. There is no sufficient cause why 25 per cent. of the people of Pennsylvania should produce in agriculture a value of $52 annually for each inhabitant of the State, while 59 per cent. of the people of Virginia should only divide $42 per head of total population. The influence of home markets on prices, with the reflex influence of prices on fertilization and culture, is sufficient to answer for all this difference. I ask, in all sincerity and deference, if it is manly or just to decry others who take advantage of opportunities enjoyed in equal fullness by ourselves, while we utterly refuse to use them? In this connection permit me to repeat what I said years ago, in the sincerest and most friendly spirit, of the unsurpassed facilities for mining and manufacturing enjoyed by the southern portion of the Atlantic slope:

"This path of progress has been equally open to all; laws supposed to favor a diversified industry have been applicable to all States alike; the best water-power and the cheapest coal are in States that make no extensive use of either; milder climates and superior facilities for cheap transportation have furnished advantages that have not been transmuted into net profits; and yet such communities, daily inflicting irreparable injuries upon themselves by neglecting the gifts of God, and spurning the labor of man, are wont to deem themselves injured by the prosperity flowing from superior industry and a practical political economy."

THE COLLECTION OF STATISTICS.

Leaving considerations bearing on the value and uses of agricultural statistics, a few thoughts may be essayed upon means and appliances for statistical collection. More attention is now drawn to this subject than ever before. It is work that requires great industry and conscientiousness in collecting and arranging, and presupposes intelligent appreciation and willing co-operation on the part of the people. Hence statistics is a science that did not flourish in the dark ages. There is even now great difficulty in statistical collection, on account of popular ignorance and prejudice, in European countries, and not a little in our own country. There is yet in many minds a suspicion that the census marshal is only a harbinger of the tax-gatherer. As an extreme illustration, the State census of Ohio returned 38,000,000 pounds of tobacco as the crop of 1869; the General Government, which levies a tax on tobacco, obtained returns of only 18,000,000 for the same crop. Ordinarily, the census makes larger figures than State assessors. For instance, in the same State, the United States reported 15,000,000 bushels of wheat in 1860, and the State only 12,000,000. Intelligent people should combat this prejudice among their neighbors, and educate them as to the value to themselves of an accurate knowledge of local resources.

The means employed and lines of investigation undertaken in the countries of the globe which encourage systematic collection of agricultural statistics are of great

variety, and the degree of efficiency attained is equally various. Specific investigations and independent research may be conducted irregularly by individuals; societies often do successful work within their own organization; but general investigation, involving every portion of the territory of a country, can only command success with the aid of the dignity and authority of government. The European governments are very generally committed to some system of obtaining the *acreage* cultivated annually in the principal farm-crops, though not all of them. In this respect they are in advance of our own, which has never included in census-laws a provision for this initial-point in statistical inquiry. The agricultural census of Great Britain, which is annual, is almost confined to an enumeration of farm-animals and the establishment of the area of each crop. The quantity becomes a matter of estimate. In this country we are left to guess the size of our fields, and the rate of production, and only once in ten years do we venture to obtain a record of gross quantities. These quantities, in the case of cereals, may, and often do, vary 200,000,000 bushels in a single year. The census of 1860 made the corn-crop of the previous year 838,000,000 bushels; that of 1870 credited but 760,000,000 to the crop of 1869; whereupon short-sighted statisticians proclaim a great decline in the culture of maize. Such an assumption is utterly unfounded. Not only is the aggregate quantity increasing, but the ratio to population—bushels *per capita*—is certainly not decreasing in any marked degree. The crop of the year 1869 was considered a failure, when Illinois actually obtained 130,000,000 bushels, though expecting in the previous July fully 230,000,000. So in wheat, the apparent increase from 173,000,000 to 287,000,000 bushels is deceptive in a less degree, and partially due to the exceptionally increased yield of 1869. The need is imperative for a census at least every fifth year, and an agricultural census, embracing area and quantity and number of farm-animals, should be taken yearly. Agitation should be continued till the people, and the Congress that does their bidding, shall be educated up to the realization of such a necessity.

The State governments have an important work to do in this direction. Ohio has long and successfully taken the initiative; Minnesota and Kansas have made a brave beginning; Iowa takes a comparatively full agricultural census biennially, and New York and Massachusetts have made quite thorough work in decennial periods intermediate to those of the national census. Other States have made partial enumerations. I am glad to learn that Georgia has commenced the work, and I hope all the people will aid in making it a thorough one. Most of the States have literally done nothing.

The collection of agricultural statistics has been made an important function of the Department of Agriculture, in accordance with its organic act. It gathers the official records of foreign governments, societies, technical schools, and those of individual workers in experimental science; of the United States census, of State assessors, and of agricultural organizations; and, in addition, has an enthusiastic corps of reporters in all sections of the United States, working unselfishly for the benefit of local agriculture and for the general weal, and monthly—sometimes oftener—aiding in a comprehensive and systematic investigation upon any topic deemed practical and important, sometimes reaching the whole country and sometimes of limited range. The work includes the reporting the condition of growing crops, the comparative area in cultivation, and ultimately the estimated product. It has proved the most reliable source of current information obtainable, has been increasing in efficiency, and can be rendered still more efficient. It is of course not a census, and is not so regarded. In the older and settled States, as to principal crops and numbers of farm-animals, the degree of reliability has compared favorably with the results of an average census, and in some points has far exceeded in completeness and accuracy the results of several State enumerations. In Kansas, for instance, it proved the assessors' enumeration of sheep to be little more than half the real numbers in the State. The official enumeration of farm-animals, in every State or Territory west of Missouri, either by census or assessors, is exceedingly incomplete. In the minor crops, and in all crops in new States, there is more or less incompleteness or inaccuracy in the estimates of the Department, from the present necessity of the case, as there is in many points in State and national enumerations.

Only Ohio has for any considerable period made such enumeration; a few others have barely commenced the work; the great State of Illinois only returns stock and two of the principal crops; and all of these publications are too late by months to aid in perfecting Department estimates. There is also a difficulty in constant, sometimes enormous, fluctuations in cultivated area. The wheat-crop in Ohio may in one year be 8,000,000 bushels, in another 28,000,000. Yet, in the settled States, especially as to principal crops, approximated accuracy has been attained. For seven years the Illinois estimates of each year were based respectively on those of the preceding; the estimated percentage of the previous year's crop was returned for each county, and these local returns were combined with due reference to the relative crop-value of each county, to form an accurate State average. In this time, not one scintilla of aid was obtained either from local official returns or unofficial estimates. What could be expected in such a case but discrepancy? Opportunity for verification was naturally awaited with misgivings. When the census was complete, the estimates and the returns of

domestic animals were as nearly alike as two independent enumerations could be expected to be. The corn-crop had met sudden disaster by early frost, and the expected yield in August had been relentlessly reduced in October by more than 40 per cent., equal to the enormous difference of 90,000,000 bushels; the census showed a reduction only about 2 per cent. less. The figures for wheat were still closer. In fact, the substantial identity on all important points was remarkable. Was this mere guess-work, or something more? The same year the estimate of wheat in Minnesota was deemed too large by local official authority, yet the census sustained the accuracy of the national estimate, and proved the State enumeration incomplete. A highly esteemed rural publicist, in New York, called in question the Department estimate of wheat of the same year, as quite too high both for New York and the entire country, and yet the census figures, afterward published, were higher still.

In the South, with a gap of years in its comparisons of production, its industrial disturbances amounting to convulsion and partial destruction, equal accuracy was impossible, and of course unattained. Information concerning the cotton-crop has been more complete and of greater accuracy than all other current data upon that subject. It is true that the preliminary estimates made during the picking season have usually been under rather than over the actual outcome; and commercial estimates have usually been placed about 10 per cent. higher. The result has been, whenever a crop decidedly short has occurred, as in 1871, the commercial authorities have been sadly at fault.

As to acreage generally, of all our crops, there has been no reliable authority, no basis whatever being furnished by the census, and none by States with very few exceptions. The Department has attempted estimates, deducing crop-acreage from estimates of aggregate production and estimated yield per acre. Now while a county estimate of total product is liable to be slightly too low, the estimated yield per acre is quite apt to be slightly too high, and if uncorrected it would necessarially make the area of crops too small, a tendency against which I have continually had occasion to labor. Some critics have flatly disputed this tendency to overestimate the yield per acre, but they have done it in ignorance of proven facts. From this consideration I have for years believed that the reported cotton-acreage might be proven by accurate enumeration somewhat too low, but have not felt authorized to enlarge it without positive proof that it is so—proof that I hope soon to be able to accumulate. I recognize fully the importance of the utmost accuracy, as the Department figures for acreage of cotton are the only basis for all published statements of such areas. As an illustration of this fact, it will be remembered that during the war great efforts were made to grow cotton largely near the northern limits of its possible maturity, and the area was estimated accordingly, and strange to say, though the effort was long since mainly abandoned, those same figures, (ten times too large for the present day,) with annual percentage modifications, are still doing duty in journalistic statistics.

But the subject is one of difficulty; no authority is infallible, and the degree of modesty with which it is treated will distinguish the superficial tyro from the experienced in statistics. Could annual enumeration be not only inaugurated by States, with a common schedule, which should include only a few plain and practical points of inquiry, but be also thoroughly made and promptly published, current estimates on such basis might be closely approximate and of greatly enhanced value. I would urge upon this body the importance of laboring to establish uniformity, to encourage in every State an annual census on such a plan, and to attempt the more difficult task of educating public sentiment to the necessity of appreciation and careful and conscientious co-operation on the part of the people.

CONCLUSION.

In conclusion, allow me to express the hope that the wise deliberation and efficient action of this body may tend to hasten the day when 25 per cent. of our people shall furnish a better and more varied agricultural supply than is now obtained by the 47 per cent. employed in agriculture; when the 21 per cent. now engaged in mining, manufacturing, and the mechanic arts may become 42; when two blades of grass shall grow instead of one, twenty-five bushels of wheat instead of twelve, and an acre of cotton always bring a bale; when clover shall appear in place of broom-sedge, the sun cease to smite with barrenness the southern slope, and many fields shall be green with mangolds for the fattening of lazy bullocks grazing on a thousand hills; when superior and more various implements shall, while dividing, multiply the labor of human muscle, and steam shall supplement and save the costly strength of beasts; when a moiety of the farmer's income may suffice to pay his taxes, his bills for commercial fertilizers, and all purchases of farm-produce that he fails to procure from his own fair acres; when railroads shall cease from troubling with unscrupulous exactions, and unnecessary middlemen are evermore at rest; when the farmer's home shall be beautiful with flowers, his farm a smiling landscape, and his barns shall groan with the burden of plenty; and, finally, when the farmer shall in every section of a broad and prosperous land be recognized as nature's nobleman, the most intelligent, just, healthy, and happy of his countrymen—"an honest man, the noblest work of God."

REPORT OF ENTOMOLOGIST AND CURATOR OF THE MUSEUM.

SIR: In the month of June Mr. J. S. Nixon, of Chambersburgh, Pennsylvania, sent to the Department of Agriculture specimens of what he calls "a new enemy to the agriculturist," in the form of a small beetle, which on examination proved to be the *Systena blanda* of Melsheimer. This insect is about .12 of an inch in length, and of a light creamy clay-color, having three longitudinal darker stripes on the wing-covers. These insects vary very much in color. Mr. Nixon writes that the beetles have nearly devastated a field of corn, eating the leaves and leaving the bare stalks standing. They hop like a flea, and when disturbed hide themselves in the soil, if they have not time to escape by flying away. They are very active and voracious, and being found in great numbers, they are very destructive to the corn-plant. They have not attacked anything but the corn (maize) so far.

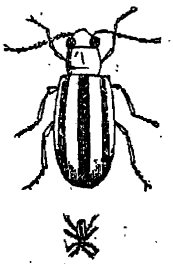


Fig. 1.

These small beetles have not hitherto been reported as injurious to any of our crops, and as they are nearly related to the cucumber or flea beetles, the same remedies used for them will apply to the *Systen blanda.*

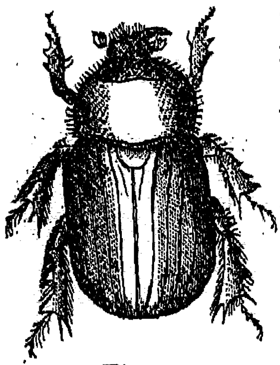


Fig. 2.

A very large black beetle with a short horn on the top or front of its head was very injurious to young ash-trees in the neighborhood of Babylon, Long Island, where it appeared in great numbers according to a letter from a correspondent, Mr. P. H. Foster, who states that after expending five days' labor in digging out the beetles his foreman estimated the number destroyed at one bushel, while Mr. Foster himself thought there were at least twenty-four quarts. He says:

> We found as many as fourteen at the root of one tree 8 feet high, and have looked over about 6,000 trees, mostly white-ash, and a few European, (*Fraxinus excelsior,*) and out of this number 1,500 had holes around them; these we opened and obtained the above results. I did not discover their depredations until they had destroyed a number of my young trees. Another season I shall study them more thoroughly.

The insect alluded to is known to entomologists by the name of *Xylorycles* (wood-borer) *satyrus*, of Burmeister, and is not very uncommon in this neighborhood, where it has been taken at the roots of ash-trees. The larva resembles the white grub of the corn-field, which is the larva of the May-bug, *Lachnosterna*, but is of a much larger size, and has a black head instead of the head being of a red color as in the common white grub. These larvæ feed on the roots of ash-trees, and have been taken also on liquid amber, a sweet gum, in Maryland.

The best way to destroy them is, in spring and autumn to dig up around the roots of ash-trees infested and to destroy white grubs, of any size whatsoever, found in such situations, as it is in the grub state they injure the roots. The perfect beetles should also be dug out at the time they make their appearance as perfect insects and destroyed before

they have had time to lay their eggs for another brood the following season.

Mr. G. F. B. Leighton, president of the Norfolk (Va.) Horticultural and Pomological Society, in a letter to this Department, in answer to some questions relating to the twig-girdler, *Oncideres cingulatus*, states that during the past season he has made some interesting observations which may be of interest to entomologists and horticulturists. After remarking on the habits of the insect, he states that a close scrutiny revealed the fact that the insects girdle the twig before depositing their eggs, although he supposed it otherwise the previous season; he also recomends burning the twigs, as spoken of in the report of 1871.

During the month of July the much-dreaded western potato-beetle, *Doryphora decem-lineata*, made its appearance in the immediate neighborhood of Washington, D. C., several of the mature insects having been brought alive to the Department of Agriculture for identification. They were taken by Mr. Charles Chapin, of the Marine Corps, in a garden, feeding on the foliage of some potatoes, and had almost ruined the plants. About the same time it made its appearance in Maryland, near Baltimore, specimens having been received from Mr. Onderdonk, president of the College of Saint James, Washington County, where they were injuring potatoes materially by devouring the foliage. Larvæ were also received from G. S. Dressler, Oriental post-office, Juniata County, Pennsylvania; so it appears that this destructive insect is making its way east, and next year we may expect to hear more of its ravages in Pennsylvania and Maryland.

In New York it appeared in four counties, viz, Wyoming, Niagara, Allegany, and Chautauqua; in the latter it was quite mischevous. Pennsylvania received a more general visitation, not less than thirteen counties reporting the presence of these pests. They were very severe in Huntingdon, Fayette, Beaver, Jefferson, Crawford, Forest, and McKean; less serious damages are reported in Snyder, Cambria, Butler, Cameron, and Berks. In Elk County they attacked the Early-Rose potatoes, which had previously been exempt from their ravages. In McKean the beetles appeared May 1, and their young began to hatch out in the third week following. The ravages of this beetle constituted almost the whole of the casualties to the crops from insect enemies in this State.

In regard to this insect a Dodge County (Nebraska) correspondent says:

> As soon as the soft bugs or grubs are hatched in the early part of the spring, I harrow the patch with a slanting (backwards) tooth harrow; the beams knock off the grubs and the teeth bury them in the soil, from which they have not power to rise. When the plants are over 6 inches high I use a two-horse four-shovel corn-cultivator, having hung sticks of round fire-wood, 3 feet long, by ropes transversely across the frame about a foot and a half in advance of the shovel-blade; the dangling sticks knock off the grubs, and the shovels effectually bury them. I do this in the middle of a hot, dry day, and have kept two acres completely clean by going through once a week, thus keeping down the bugs and the weeds at the same operation. Two to three hours' work of this kind will accomplish more than a dozen children in a whole day with sticks and pans, according to the old way.

Our correspondent in Union Parish, Louisiana, describes an insect feeding upon the potato, which he supposes to be a larva of the *D. decem-lineata*, but his description is not sufficiently accurate to distinguish it from another species, *D. juncta*. It is a broad, stumpy worm, nearly as broad as long, head black, color reddish brown, with black spots extending along the sides of the body.

In Randolph Co., West Virginia, the beetles were quite numerous, being picked off the vines. In Braxton, Barlow, Cabell, Marion, and Morgan

they were very destructive. They were also present in Doddridge and Kanawha, in the latter of which they were making their first appearance. In many cases they were effectually resisted by the farmers. Our correspondent in Tyler speaks of a species of potato-bug but little known and very destructive. Some farmers sprinkled lime on the vines, and others turned in their chickens. Our correspondent would confer a favor by sending a specimen to the Department. Six counties in Kentucky report the presence of this insect. In Spencer a third of the potato-crop was destroyed; in Henry, Livingston, Anderson, Fayette, and Shelby the losses were lighter. The ravages of the beetle were here successfully resisted either by sprinkling Paris-green upon the vines or by shaking them off into vessels and destroying them wholesale. In Henry the lady-bug (*Coccinella*) destroyed the eggs of the beetles in great numbers.

North of the Ohio River this insect is reported in every direction. In Ohio, the destruction was mostly in the northern counties, though the beetles were threatening in Highland, in the southwest. In Washington and Meigs, in the southeast, fear of the pest had greatly restricted potato-planting, and hence the insect had but little to feed upon. In Morrow the crop was cut down one-half; in Franklin, 20 per cent. in spite of strenuous resistance; in Trumbull the entire crop was threatened; in Logan, the beetles re-appeared in apparently undiminished numbers after every effort for their destruction. Great havoc is also reported in Stark; some Swiss residents of this county state that this beetle is known in Switzerland. In Mahoning, Medina, Portage, Geauga, Marion, and Noble the insect was more or less injurious. In many cases it was destroyed by persistent and intelligent efforts, and the crops substantially saved. They were destructive also in several counties of Michigan, such as Lapeer, Manistee, Mason, and Branch. In Antrim, however, "the farmers have the inside track," while the annoyance had perceptibly diminished in Monroe, Benzie, Tuscola, Shiawassee, and Hillsdale. The beetles were very numerous in Johnson, Martin, Cass, Dubois, and Orange Indiana. In Howard, the lady-bug was efficiently destroying them. In Franklin they were less troublesome than last year. Paris-green was extensively used in some counties with varying success. Great damage was done in Mercer, Ogle, Boone, Lake, Winnebago, and Bureau Illinois, while in Stephenson, Montgomery, and Madison they were of small import. La Crosse County, Wisconsin, reports an increased number, while in Columbia, Adams, Juneau, and Clark they were very troublesome. In Portage they were very thick, but were preyed upon by other insects to an increasing extent. In Ozaukee they had lost their terrors, being easily destroyed. In Brown abundant rains enabled the vines to grow in spite of them.

In Minnesota the devastations were more severe in Ramsey, Houston, Isanti, Meeker, and Wright, while in Renville they were less numerous than formerly. Our correspondent in Rock reports a new potato-bug as destructive as the striped bug. Only three counties in Iowa—Tama, Winneshiek, and Muscatine—report the presence of the Colorado beetles.

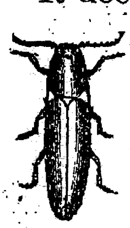


Fig. 3.

It does not appear to be generally known that a luminous beetle closely resembling the "*cucuyo*" or fire-fly of the West Indies is found abundantly within the limits of the United States, and although the fact may not be of any value to the agriculturist, it must yet be interesting to entomologists in general. We therefore make extracts from a letter from a valued correspondent, Mr. N. B. Moore, Manatee, Florida, who at the same time forwarded with his letter specimens of an insect, which proves to be the *Pyrophorus physoderus*, (Fig. 3,) a

species of snapping-beetle, and closely resembling the *Pyrophorus noctilucus*, (Fig. 4,) or far-famed fire-fly of the West Indies, with exception of size, as will be seen by the wood-cuts.

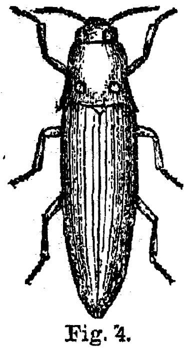


Fig. 4.

Mr. Moore writes that "these insects are very plentiful on the 'pine-barrens' and among saw-palmettoes, having captured as many as nineteen on the 28th of August. The common 'lightning-bug' or fire-fly, (*Photinus pyralis*,) is also abundant, but appears an hour earlier in the evening, and, no doubt, has often been mistaken for this insect. In its manner of flight the *Pyrophorus* seldom rises more than three feet above the earth, so as to pass close over the tops of the vegetation. Their flight is also much slower and more meandering. The light is emitted from the reservoirs of the thorax at the base of the spines and through them. When on the wing it is generally, if not always, continuous and equal in amount, as seen from above or below. I do not think it is remittent, and there is no flash, and in amount there is less than the *Photinus pyralis* emits at the time of its flash; there is no perceptible difference in the color of the light of the two species, except that which rises from degree of intensity. Its utmost luminosity is attained when running on the ground. When placed upon a quilt or pillow an almost dazzling effulgence emanates from the thoracic reservoirs, seemingly from the disks or perhaps globes, one at the base of each spine. If caught and held between the thumb and finger gently, the same effulgence is emitted. If the insect stops running or takes wing the light emitted is much less, though a fixed phosphorescence.

"Experiments in a dark room, with eighteen of the *Pyrophorus* and one of the common *Photinus* on a table, enabled me to compare the light of one of the former with that of the latter at their maximum brilliancy, and I find them about equal; though, as one is a flash and the other a continuous light, I think the latter is really superior. I have not found the one, when in its native habitat, intruding upon the possessions of the other, but they keep apart. When examining them with a glass, I discovered, while observing one that lay upon its back, other sources of illumination; luminous dots, in pairs, were first detected along the lateral margins of the abdomen, and transversely opposite; the anterior pair rather faint, indeed not discovered till after the next succeeding pair were seen; the next bright; the third pair I would rate between them in luster; a fourth pair a little fainter; these united by a line of light extending across the abdomen at the junction of the segments. I could discover no trace of concurrent or sympathetic action between the light emanating from the thorax and that from other parts of the body, nor could any mode of teasing the insect induce an augmentation or diminution of light from the last.

"The *Pyrophorus* has a habit, before it becomes jaded, of throwing itself up from the ground or other surface when placed upon its back, by a spring or jerk of the head downward, and can throw itself to a height of six or eight inches. I found the combined light of eighteen, in a two-ounce vial, not sufficient to enable me to read a newspaper, as one could desire to do in a public assembly."

In answer to a request for living specimens, Mr. Moore replies that those he confined died in less than thirty-six hours.

Grasshoppers have been reported as quite destructive in many parts of the country. As no specimens have been forwarded, however, it is a little difficult to say in some cases which of the two species, *Caloptenus spretus* and *C. femur-rubrum*, are intended.

Only four counties east of the Mississippi reported the presence of these insects. In some localities of Carroll, New Hampshire, they were very numerous, and it was feared they would do great damage to the growing crops. In Warren, Virginia, they destroyed some of the pastures, and made demonstrations upon oats and barley. In Jefferson, West Virginia, they appeared in great numbers; so thick, in some places, that it was possible to take them up by the shovelful. They were also reported as "thick" in Edwards County, Illinois.

West of the Mississippi their mischievous influence was felt from Texas to Minnesota, and westward to the Pacific coast. Texas had an especially severe visitation. In Medina and Bandera counties they nearly destroyed the grain-crops, vegetables, and fruits. They were also very destructive in De Witt, Blanco, and Kendall. In San Saba, their presence delayed corn-planting till May 1. In Murray County, Minnesota, these pests appeared June 12, and ruined many late-sown crops. In Jackson they appeared in countless numbers and remained about a week, eating up the crops very clean. In Cottonwood they appeared June 15, coming from the southwest, and were very destructive, especially upon the wheat-crops, reducing the yield of the county to only a half average. At the date of the report the young were beginning to hatch. In Blue Earth they were observed coming in the same direction.

The correspondent in Martin County leaves the condition of spring wheat and barley without note, since both are now covered with grasshoppers. These appeared in the western and southwestern parts of the county, June 17, and twenty-four miles more easterly on the 21st. They appeared about noon, on days of sunshine, high in the air, seeming in the sunlight to be of a silvery hue, their wings light-brown. At first scattering widely, the second day at noon they appeared in immense numbers, filling the air even to the ground. Gardens were first attacked, onions and cabbages fall before their ravages in the beginning, and, following, all tender plants, even tobacco and wormwood; next barley and wheat, the leaves of which they strip in patches. About the fourth day, increasing in numbers, they made a united attack on nearly all kinds of grain—seeming to leave corn and peas comparatively undisturbed. About the seventh or eighth day they began to rise, leaving finally about the eighth or ninth day about noon. Millions of these insects may at that time be seen flying in the air in the wind direction. They began to leave Martin County on June 29, and four or five days had elapsed before all had gone. They injured but did not destroy the wheat-crop, some pieces being left almost unmolested, while others were badly stripped. Vegetable-gardens were generally ruined. A tract of two thousand acres of beans, planted by a company consisting of three Englishmen, who broke the prairie, was to the extent of nearly three-fourths devasted by grasshoppers.

In Pocahontas County, Iowa, they appeared, in the fore part of June, in an army thirty miles from front to rear, moving eastward on the ground till noon, when they took flight, flying very high. Their rear passed two weeks after their front had first appeared. They destroyed 50 per cent. of the crops. In Emmett the barley was entirely destroyed and other grains seriously damaged. Greater or less injuries are reported in Cherokee, Calhoun, and Woodbury.

In Burt County, Nebraska, the young insects were hatched out in immense numbers too late for small-grain crops, but not too late for corn. They also appeared in Boone and Dixon in large force, where they deposited their eggs and did much mischief. The correspondent in Dixon,

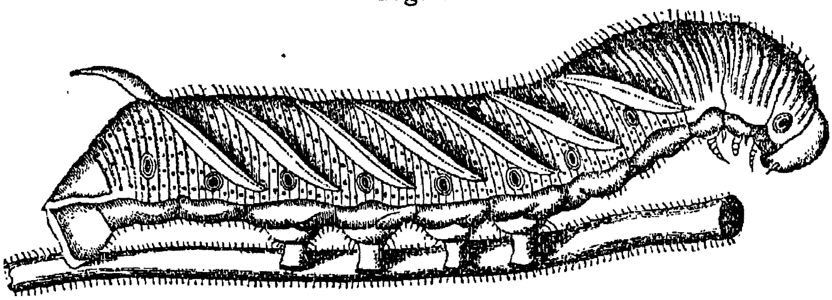
after careful examination, is satisfied that not over a third of the eggs deposited were hatched. They hatched out largely in Larimer County, Colorado. In San Luis Obispo, California, they were destructive on grain-crops, while in Fresno they were equally injurious to corn and cotton.

Dr. F. C. Renner, of Frederick County, Maryland, writes to the Department that several years ago he collected some poke-root (*Phytolacca decandra*) for medicinal purposes, and placed it at various places about the house to dry. After several days he observed that there were many cockroaches lying dead, and upon examination found they had been partaking freely of the poke-root. Some of the root was placed near their haunts, and the result was that it rid the premises of those insects. Since then he has communicated the remedy to others, who have tested it with satisfactory results.

We have not yet had an opportunity of trying the efficacy of the root as an insecticide, but shall test it in the spring. Should any of our correspondents have experimented with it, they will oblige us by giving the result of their experience before we venture to recommend it for general use.

The tobacco hawk-moth or "horn-blower" of Maryland, *Macrosila* (*Sphinx*) *carolina*, Linn., is a large moth, the caterpillar of which, commonly known as the tobacco-worm (Fig. 5) in the Middle States, is

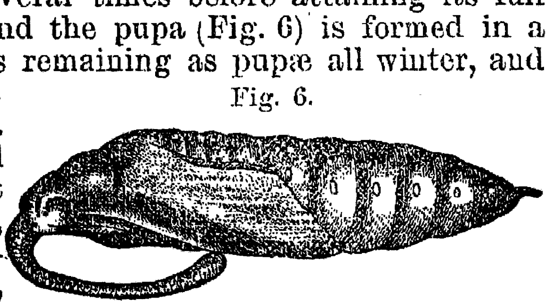
Fig. 5.



very destructive to the leaf of the tobacco-plant, when the worm is young, by eating holes in the leaves, thus spoiling them for use as wrappers for cigars, and when old by devouring the whole of the leaf itself. These worms appear of all sizes, during late summer and autumn, in the tobacco-fields in Maryland, the first brood of eggs hatch in May or June.

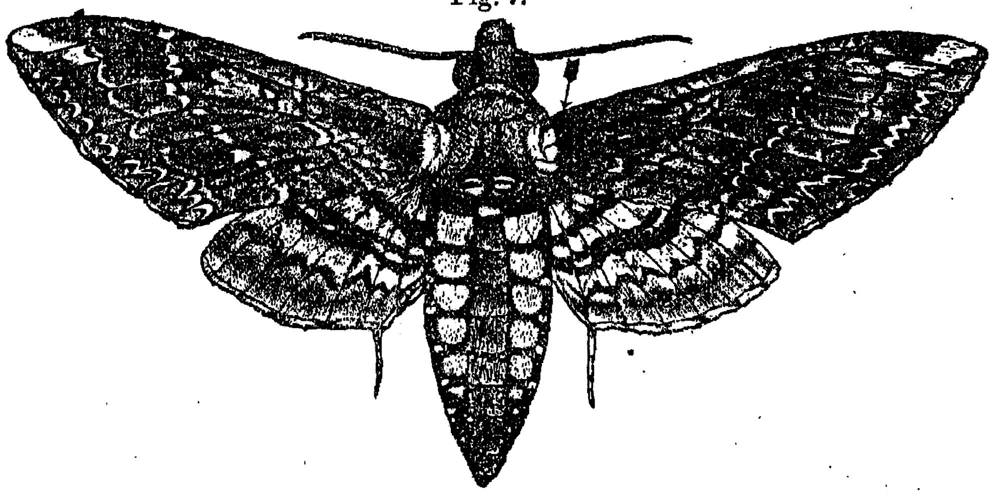
During the last season the Department has received numberless letters on the subject of their ravages, desiring information concerning their habits, and the best remedies that can be suggested for their destruction. We shall therefore give a short description of their transformations from the egg to the perfect fly. The egg is deposited singly on the leaf of the tobacco or tomato plant, and the young worm when first hatched out by the heat of the sun, commences to eat holes in the leaf of the plant, and sheds its skin several times before attaining its full size; it then goes into the earth and the pupa (Fig. 6) is formed in a subterranean cell, the late broods remaining as pupæ all winter, and coming out as the perfect fly the following spring. The insect (Fig. 7) appears from June and July until late fall. It hovers in the twilight like a humming-bird over flowers, especially honeysuckle and Jamestown weed, *Datura stramonium*,

Fig. 6.



sucking the nectar by means of its long, flexible tongue, which, when the insect is at rest, is coiled up like a watch-spring under the head. The tongue when unrolled measures four to six inches in length, and the caterpillar feeds also on the potato, red pepper, and tomato, as well as the tobacco. This insect is almost exactly like the northern so-called potato-worm in all the states of lava, pupa, and insect, and can scarcely be distinguished from it by young entomologists; but in the "tobacco-worm" the anal horn on the tail of the caterpillar is *reddish* instead of bluish; it also has no longitudinal white stripe, the pectoral feet are ringed with black, the body is more hirsute, and the insect itself is more indistinctly marked, and always has a white mark at the base of its wings and partly on the thorax, (Fig. 7,) which the moth of the potato-worm has not. (Fig. 8.)

Fig. 7.

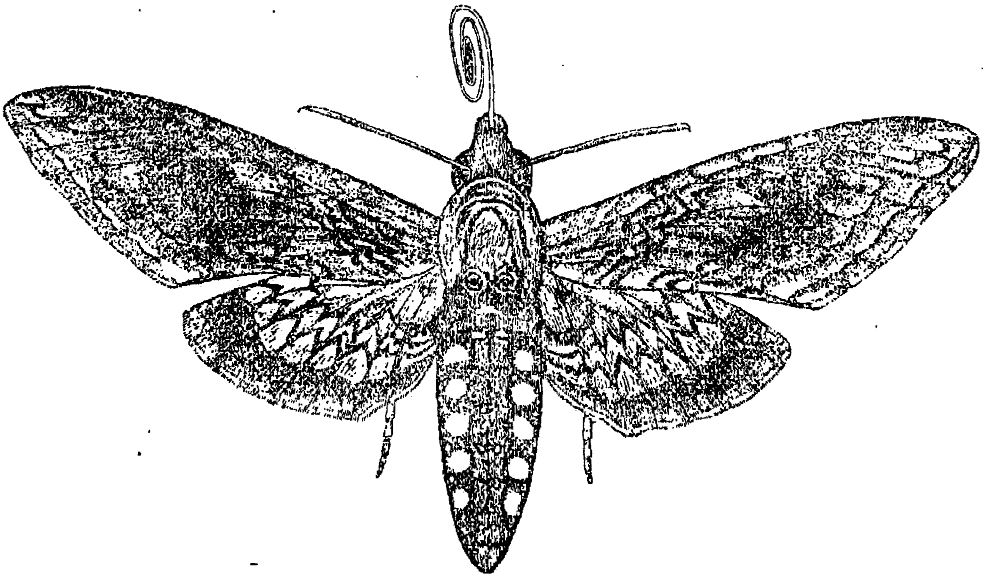


The potato-worm is also found feeding on the tobacco in Maryland, and frequently a black or nearly black variety of the worm is taken, especially towards the end of the season. The potato or tomato worm has also been accused of being poisonous, but this is entirely erroneous, as the horn on the tail of the caterpillar is incapable of inflicting any serious wound, and has no poisonous properties whatever. The potato-worm is the northern species, and in Maryland the two species meet, and are found indiscriminately together in the tobacco-fields, yet never mixing, but remaining perfectly distinct, although so nearly allied in appearance, habits, and food.

There are several parasites, and one in particular, that is very useful in destroying the potato and tobacco worm. It is a minute, four-winged fly, (*Microgaster congregata*,) which deposits its eggs in the caterpillar, and eventually kills it. The eggs of this parasite, to the number of one hundred or more, are deposited in the back and sides of the caterpillar, in small punctures made by the ovipositor of the fly. The larvæ, when hatched, feed upon the fatty substance, and when fully grown eat a hole in the skin, and each maggot spins for itself a small white oval cocoon, one end of which is fastened to the skin of the worm, and the caterpillar appears as if covered with small oval white eggs. Eighty-four flies were obtained from one caterpillar by Say, and Fitch counted one hundred and twenty-four cocoons on another worm, so that these insects must destroy a great number of worms. The parasite, however, is said to be destroyed by another hymenopterous insect, (*Pteromalus tabacum*,) which deposits its eggs in the cocoons of the microgaster.

Another species, forming an immense mass of loose woolly cocoons, is also said to kill the caterpillar of the potato-sphinx, and most probably

Fig. 8.



attacks also that of the tobacco-worm in a similar manner. It is, therefore, of great consequence when destroying the caterpillars by hand-picking to avoid crushing or injuring any caterpillars which appear to have either white floss or egg-like cases on their backs or sides, as these are the cocoons of a very useful insect, which, if left undisturbed, would produce multitudes of flies, which would destroy an immense number of these injurious worms.

The hornets, and an orange-colored wasp, taken by Walsh for a *Polistes*, devour the caterpillar when young and small. The best remedy against these insects, however, is to poison the fly which produces either the potato or tomato worm, by dropping a mixture of "blue stone" of the druggists, or crude black arsenic, into the flower of the Jamestown weed, or stramonium, in the evening, when the fly will come and insert its long proboscis into the flower, sip up the poisonous mixture, and die before depositing its eggs.

A correspondent from Tennessee finds it advantageous to cultivate a few plants of the Jamestown weed among his tobacco, and then to poison the blossoms, as they appear, with the above-mentioned liquid, every evening, and has thereby saved a great part of his crop uninjured. In Maryland some tobacco-growers utilize young turkeys by driving them into the tobacco-field, where they pick the worms from the leaves. Some planters also pay a small premium to children for the dead millers or flies, which are readily killed with a piece of shingle or board as they hover over the flowers in the evening twilight.

Mr. Fred. J. Kron, of Albemarle, North Carolina, in a letter to the Department, complains bitterly of the injury done to all varieties of grape-vines by the grape-vine borer, *Ægeria polistiformis*, described and figured in former reports of the Department, (1854, p. 80, and 1867, p. 72.) Mr. Kron states the insect has destroyed for him one hundred and seven varieties of grapes, derived from the Luxembourg, in Paris, including some five thousand vines; and adds, that there is but one variety that has, so far, defied its ravages, and that is the scuppernong, which flourishes in the midst of the devastation caused by the borer, all around it.

Mr. Kron likewise states that he found a phylloxera on a Clinton root, and adds: "The insect has been noticed here for more than thirty years," but he does not complain of its doing much injury.

In connection with this last-named insect, so destructive to the grape-vines of France, Mr. Gaston Bazille, vice-president of the Agricultural Society of Hérault, publishes a remedy for the Phylloxera, which is translated and republished by Mr. Charles V. Riley, in the New York Tribune, as follows:

Three holes are made around the injured or infested vine, varying the depth according to the nature of the soil, but generally $2\frac{1}{2}$ feet. These holes were made in the experiments reported, by means of a pointed iron bar and a heavy maul. A tube, with a funnel attached, is placed in the hole, two ounces of sulphuret of carbon are poured into the tube, which is then closed with a cork. The vapor of the sulphuret of carbon permeates the soil and impregnates all the roots of the vine. The gas engendered (though not the case with the liquid) is not fatal to the vine, but is sure death to the insects. Four ounces of the liquid has been found sufficient for an ordinary vine; but sprinkling on the surface must be carefully avoided, as it is in such a case very injurious to the vine, whereas a pound may be used in the soil without injury to the roots.

The following article on the same subject, from the Bulletin des Sceances de la Societie d'Agriculture de France, 1872, p. 514, may be of interest to some of our wine-growers as showing the good effect of an application of soot for the destruction of the grape-vine root gall-louse. However, not having tried the soot ourselves, we can only give the experience of others, and add that Dr. Erni, formerly chemist to the Department of Agriculture, in a letter from Berne, Switzerland, has also highly recommended the use of soot for the same insect.

M. Rogier, mayor of Poule Gard, exhibited to the central society of agriculture the results obtained by the use of soot in the treatment of vines attacked by the *Phylloxera*. A young vine attacked by this insect in 1869 was treated with soot put at the foot or root of each stem in the quantity of a half kilogram, (about one and one-tenth of a pound.) The vine recovered. The following years all the stems which composed it were smoked with soot. This vine has a remarkable vigor, while the neighboring vines were dead or seriously injured. All vines treated with soot, used as a preservative compost, are healthier, although surrounded with diseased vines.

We give the above extract for what it is worth, and hope some of our correspondents will try soot and report the result to the Department, as we have scarcely any of these destructive insects in our own immediate neighborhood. In reference to this insect, the grape-root gall-louse, the Department has received a very interesting letter from Mr. George W. Campbell, of Delaware, Ohio, in which he expresses the opinion that the aphis (*Pemphigus*) affecting the leaves and that upon the roots are not identical. He says:

I have since then found in two instances what were doubtless eggs of the *Phylloxera* (root-gall-louse) upon diseased roots the same as those within the galls, but solitary, and not in clusters as in the galls. This, I think, settles the question, that the aphides infesting the roots are propagated under ground upon the roots, and that they are probably not the same as are propagated in the galls upon the leaves.

Mr. Campbell also sent specimens of the roots injured, together with numerous root-gall-lice clustered upon them, but although carefully examined with the microscope we failed to find any eggs whatever upon the roots sent. These roots, however, have been planted just as received, with the insects upon them, in a flower-pot, and placed in a large wardian case in close contact with other pots containing healthy vines, in order to find out if the insects will pass from one vine to another during the winter, and if the healthy roots will next season be infested with either root or leaf gall-lice. We give Mr. Campbell's remarks merely to stimulate further inquiry into the identity of the two insects,

as many naturalists have stated them to be merely varieties of the same insect. In France it appears that flooding the vineyards at certain seasons to drown the insect out has been recommended, but this plan, even if successful, could only be carried out in level places, and could not be adopted in side hill vineyards.

The roots of the grape-vines, both foreign and native, in the gardens of the Department of Agriculture, have been examined carefully for the *root* gall-louse, especially where the vines appeared sickly and weak, and although the grape-vine *leaf* gall-louse, *Pemphigus vitifoliæ* of Fitch had been extremely plentiful on two of the vines (Muscat-Hamburg and Black Prince) in the grape-house, indeed so much so as to necessitate cutting them down, yet neither on these vines nor on any others near them could a true *root*-louse (*Phylloxera*) or any other insect be found, either in the autumn, winter, or spring. A deep trench was also cut between a long row of grape-vines planted for experimental purposes, and the roots being exposed, were carefully examined, yet none of the destructive-root-inhabiting species could be found. Subsequently, however, Mr. J. E. Planchon, of Montpellier, France, (on his late visit to Washington,) made a most thorough investigation of the grape-vines, and after examining sixty of the plants most thoroughly he found only from four to six of these insects alive on the roots. It is also to be observed that this year none of the leaf-gall species, known as the *Pemphigus vitifoliæ* of Fitch, have been found on the foliage of the grape-vines at the Department, but the vines have been much injured by the small insect erroneously known as the grape-leaf thrips, which is a species of frog-hopper, (*Erythroneura*,) belonging to the order *Homoptera*, and which by sucking out the sap causes the foliage to assume a withered and spotted appearance, and, if very numerous, causes the leaf to be shed.

Mr. M. B. Wever, of Johnson's Depot, Edgefield County, South Carolina, presented through Mr. Charles R. Dodge, a very remarkable specimen of the nest and spider of the so-called trap-door spider. Some doubts having been expressed as to the locality of this spider, Mr. Wever writes:

> I found the spider about the 1st of February (!) on an elevated piece of ground near my house, six miles east of Edgefield village, the county-seat of Edgefield County, on the head-waters of Turkey Creek, on my farm, twenty-five miles north of Augusta, Georgia, near Johnson's Depot, Charlotte, Columbia and Augusta Railroad. I took the spider from the ground only a short time before it was shipped. It feeds only at night. A few years ago I had a mate to this. The hole was built under the pillar of my house. In visiting the nest at night I have found the spider absent on two or three occasions, but always at home during the day.

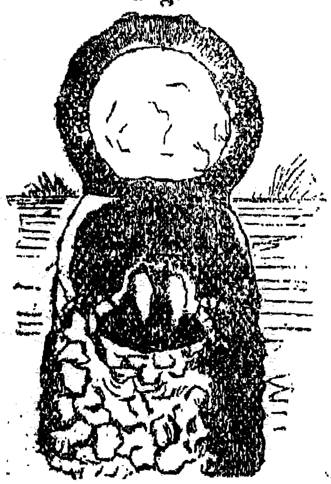
The spider sent by Mr. Wever so closely resembles, in form of nest, habits, &c., the *Cteniza nidulans*, or trap-door spider of the West Indies, described by Mr. Gosse, in his Sojourn in Jamaica, that we doubted its having come from South Carolina until we received Mr. Wever's interesting letter, and we shall therefore make some extracts from Mr. Gosse's account of its natural history, &c.

The spider first digs a cylindrical burrow with its jointed fangs and mandibles, from four to ten inches in depth and about an inch in diameter; the bottom is rounded, and the top, which is level with the surface of the earth, is closed by a circular lid, continuous with the tube for about a third of its circumference. This part may be called the hinge. The mouth of the tube is commonly dilated a little, so as to form a slightly curved rim or lip; and the lid is sometimes a little convex internally, so as to fall more accurately into the mouth and close it.

Our specimen agrees in every respect excepting that the lid or trap-door is nearly circular, but with part of the circumference cut off, so as

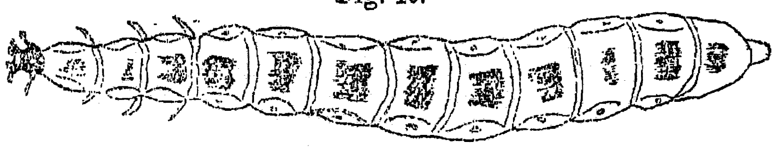
to form the hinge to the lid. The lid itself is composed of fragments of earth, spun together with a light gossamer web, and appears to be thicker where it forms the hinge to the trap-door. The spider itself never makes its appearance during the day, but must hunt for its prey at night, as several flesh-flies, put in the glass globe in which the nest is placed, invariably disappear before morning. When the lid is disturbed, the spider holds it down by means of its claws, and it is with the greatest difficulty that it can be opened, the animal exerting its whole strength to prevent its being accomplished; but when this is effected it retreats to the bottom, whence it may be partially drawn up by placing a twig in the burrow, which the spider savagely seizes with its jaws, and may then be partially dragged into daylight. A piece of string, inserted one day under the trap-door to facilitate opening it when required, was removed by the spider and cast outside.

Fig. 9.



We have only been able to give an imperfect sketch of the nest and spider, as the animal could only be seen for a very short time, when momentarily dragged into view, as it almost instantaneously retreated to the bottom of its burrow as soon as brought into daylight, and we were afraid of killing it outright if it had to be forcibly dragged from its burrow. From what was seen it appeared to be of a dark-brown color and somewhat hairy. Mr. Wever, at the same time, sent a large larva of a cream-color, shaded with chestnut on the back, that was very luminous, and showed a bright phosphorescent light in the rings of the body and spiracles. This light was of a pale bluish color, and so bright that it could be plainly seen in daylight, by putting it in a dark corner, or shading it with the hand. As the larvæ of *Melanactes*, a species of *Elater* or "snapping-bug," are said to be luminous, it is possible that our larva (Fig. 10) belongs to the *Elateridæ*. It was found in wood-earth, but died soon after it was received.

Fig. 10.



As much confusion has hitherto existed, and yet exists, relating to the habits and appearance of the true cotton caterpillar, *Anomis xylinæ* and as there is another insect (the grass-worm) infesting the cotton-fields about the same time the real caterpillar makes its appearance, it will be well to repeat a portion of our report on this insect published six years ago, and mention some distinguishing marks by which the cotton-moth may be recognized in either the egg, caterpillar, chrysalis, or perfect state. In the first place, the egg of the cotton-worm is round and very much flattened in form and of a green color; whereas the egg of the boll-worm is round, somewhat bluntish, conical in shape, and of a yellow color. The egg of the cotton-worm is mostly deposited on the leaf or branches, while the egg of the boll-worm is usually placed in the so-called ruffle or envelope of the flower. The caterpillar of the cotton-worm has six pectoral or front feet, two anal, and eight ventral; the two foremost of the ventral feet being *very small, apparently useless*, and not employed for

grasping like the other six; while in the grass-worm the legs are all perfectly formed and used when creeping from leaf to leaf. Owing to this imperfection in the formation of the first pair of ventral feet, the cotton caterpillar always moves like the span-worm or looper; that is, by alternately contracting and expanding its body, holding fast by means of its hind feet to the object on which it rests, while the head and fore feet are extended as far as possible; the stalk or leaf being securely grasped by the pectoral feet, the hinder part and legs are suddenly brought up to them, so that, at every step, the body assumes the shape of an arch; whereas the grass-worm glides along by moving its feet alternately and gradually, without raising the middle of its body from the leaf. The cotton-worm has also a habit of doubling itself up suddenly when disturbed and springing to a distance, but the grass-worm merely rolls itself up somewhat like a snake when coiled. The cotton-worm when about to change spins a very loose web or cocoon in or among the leaves or branches of the cotton-plant, or weeds infesting the field, at some distance from the ground. The grass-worm, on the contrary, comes down from the plant it has fed on and retires under stones, loose earth, or buries itself in the ground before forming its cocoon. The perfect moth of the real cotton-worm is much more angular and graceful in form, with the upper wings of a somewhat reddish or claret-colored brown, and there is always a darker spot, having a light center, more or less defined in the middle of these wings, while the under wings are of a dark ash-color. The grass-worm moth is much more clumsy in form, its upper wings being clouded and barred with dark and light grayish brown, while the under wings are lighter colored.

The visitation of the cotton-caterpillar during the season of 1873 was one of great severity in the more Southern cotton States. It appeared without doing much damage in five counties of South Carolina—Richland, Williamsburgh, Laurens, Marlborough, and Orangeburgh. It was reported as not very injurious in Brooks, Lee, Muscogee, Macon, Worth, Glynn, Baldwin, and Twiggs Counties, Georgia; but its ravages were quite serious in Decatur, Schley, Marion, Early, Coweta, Calhoun, Jefferson, and Stewart. In Early County it is stated that those worms which had not webbed up were eating the young bolls. In Macon the caterpillar required a longer period for procreation, and showed far less of destructive energy than formerly. A few persons in this county denounced the effects of poisons as worse than the injuries of the worms, but no specific facts were presented.

In Florida injuries were comparatively light in Jackson, Gadsden, Columbia, Alachua, Hamilton, and Suwannee, but more severe in Jefferson, Liberty, Wakulla, Madison, and Leon. Experience varies in regard to Paris green and other poisons. In Liberty the worms appear to ignore and despise all efforts for their extirpation. In Madison few had faith enough to try any remedies. In Jefferson some were successful for the time, but complained that the worms returned after ten or twelve days. In Leon judicious efforts of this kind were quite successful.

In several counties of Alabama the caterpillar was quite active even in July, the injuries being more severe on fresh bottom-lands. In Montgomery the pest appeared fifteen days earlier than last year. Severe injuries were experienced in Russell, Marengo, Macon, Dallas, Conecuh, Choctaw, Hale, Barbour, Henry, Clarke, Pike, Butler, Perry, and Autauga; the infliction was lighter in Crenshaw, Chambers, Wilcox, Coffee, Jefferson, and Greene. In Franklin the caterpillar has never been known. In many localities Paris green and other poisons were used

with variant success, but many had too little faith in their efficacy and too much apprehension of accidents to use them properly. In such cases the insects were only checked and not destroyed. In Perry and Dallas poisons were used with satisfactory results when judiciously applied at an early period after the appearance of the worms.

In Mississippi caterpillars were noticed about the last week of July, though in Warren they put in an appearance on the 6th. They lightly affected Newton, Rankin, and Wilkinson, but were more numerous and destructive in Warren, Marion, Lowndes, Kemper, Clark, Washington, and Noxubee. Paris green and arsenic were in great demand in Marion, but their efficacy had not been decisively tested.

Caterpillars were reported in several parishes of Louisiana: Avoyelles, Cameron, East and West Feliciana, Tensas, Rapides, Madison, Franklin, Concordia, Carroll, Caddo, Bossier, Richland, Iberia, Union, and Tangipahoa. The most serious injuries were felt in Avoyelles, Caddo, Rapides, and Tangipahoa. In Avoyelles Paris green was extensively used, and its efficacy was awaited with special interest.

These worms were comparatively innoxious in several counties of Texas—Collin, Wood, Washington, Walker, Victoria, Uvalde, Matagorda, Fayette, De Witt, Burnet, Rush, and Blanco. They were more severe in Leon, Lavaca, Austin, Grimes, Liberty, Smith, Fort Bend, and Montgomery. In the last-named county half the crop was saved by the energetic use of poisons. Several specific preparations of Paris green were reported as successful in different counties. In Liberty County the worms were quite destructive upon red land, but seemed to avoid the crops on gray land.

In Union, Hempstead, Dorsey, Columbia, Drew, and Clark, Arkansas, these worms were not very formidable, but they made their mischievous power felt in Polk and Ashley. A new cotton-insect appeared in Jackson, Georgia, boring into the forms and causing them to drop. *Per contra*, in Jackson, Florida, an enemy to the caterpillar was observed in some unknown insect, which largely destroyed it.

The following circular, on a subject the importance of which will be generally acknowledged, was sent early in the fall to the regular corps of Department correspondents in the cotton-growing States:

The annual losses of cotton from ravages of cotton-insects amount possibly to half a million bales in years of insect prevalence. One-fourth of a million bales would be deemed a light infliction, and yet, at $100 per bale, such a loss would be equivalent to $25,000,000. The methods to be employed for lessening their ravages have been heretofore canvassed by the entomologist of this Department. The remedy can only be applied by the planters themselves, and their own experience can best render practicable and efficient the means employed.

Numerous correspondents have of late been experimenting with a mixture of Paris green and flour or plaster, dusted on the plants when wet with dew—a remedy which has proved very efficient against the Colorado potato-beetle and other insects. Some report this remedy effectual against the cotton-caterpillar, while others declare it of no value whatever; others still hesitate to try it for fear of poisoning. It is of the utmost importance that the facts in the experience of planters the present season should be carefully reported, showing the quality and proportions of material used, the method and frequency of its application, and the observed results, that a thorough test may be made of its value or worthlessness. The answer of the following questions is therefore requested:

1. What is the result of your experience or observations as to the efficacy of Paris green, or other arsenical compounds, mixed with flour or plaster, for the destruction of the cotton-caterpillar?

2. In what proportions, and in what mode, time, and frequency of application have experiments been made?

3. Have any injurious effects of the poison been observed, either upon the plants or the soil, or in human poisoning in its application, or in the destruction of beneficial insects, as bees, &c.?

4. Have you used any other remedies, or means of extirpation, such as fires or torches in the fields, to destroy the perfect moths on their first appearance, and with what success?

Returns were received from one hundred and seventy different counties in the cotton-growing States, Alabama and Texas being represented by the most numerous and complete statements. Of these one hundred reported that no experiments with Paris green or arsenical preparations had been tried; many were from counties in which little cotton is ever grown, and others were from counties where the worms have never appeared.

1. *Efficacy of Paris green.*—Of the seventy returns reporting actual experiment a large proportion, at least four-fifths of all, declared the success, either full or partial, of the application of mixtures of Paris green or other arsenical compounds, when they are properly applied. Some are content with the simple declaration that it is an effectual remedy. Where it is most generally used it is most approved. In New Iberia, La., where a machine that will powder 15 to 18 acres per day was used, fifty planters found it successful. In Wilkinson, Miss., where a simple compound of Paris green and flour was used, "rows treated with the compound were healthy and vigorous, while neglected rows beside them were destroyed." In Landry, Tex., "one application of Paris green in solution resulted in ten additional bales in a field of 35 acres, over the rate of production in other fields where none was used." A similar result is reported from Montgomery, Tex., by the use of Paris green mixed with lime or plaster, or even fine sand, where "a neighbor has picked already ten bales of 500 pounds each from 13 acres, while freedmen on the same farm lost their whole crop by refusing to use it." The correspondent in Worth County, Ga., declares it "was death to everything that eats the leaves that have been sprinkled." Some correspondents enjoin the necessity of repeated applications to meet the appearance of successive broods of worms, as enough are left after the most careful application to perpetuate the noxious race. In some cases, caution is suggested not to make the application after the bolls are open, lest it become "dangerous to picker and ginner." In the cases of failure mentioned there appears no evidence that the application was properly and persistently made, and with a pure article of Paris green. In some cases where it killed both worms and plants it is very evident that the proportion of Paris green was too large or applied too heavily.

The following extracts representing different phases of the experiment will illustrate the tenor of the returns on this subject:

Craven, N. C.—Has been used in the county. Checked the worms at points where applied. Rains were frequent, labor scarce, and the experiments not continued, and the cotton was eventually damaged.

Beaufort, N. C.—Have heard of but two instances where Paris green was used to stop the ravages of the worm, and in both cases without benefit.

Calhoun, Ga.—Paris green has failed, though from 7 to 8 pounds of the green were applied to the acre every two weeks.

Jefferson, Ga.—The remedy worse than the disease. It occasioned more loss of forms and young bolls than the insect.

Macon, Ga.—Patent remedy used, but not successful. Used about 25 pounds on eight acres.

Talbot, Ga.—Experiments too limited to furnish an opinion—and mainly with arsenic in solution. It kills both plant and insect.

Duval, Fla.—Experiments with compounds, of which Paris green has been the principal ingredient, have been very successful. In every case, except where an inferior article has been used, the green has exterminated the caterpillar.

Gadsden, Fla.—No good results. Killed plants and worms.

Jefferson, Fla.—Paris green and flour destroyed and drove them away. Those parts of the plantations where applied are green and thrifty, while cotton not so treated is destroyed.

Liberty, Fla.—Paris green, combined with flour or other matter, except water, is a humbug.

Blount, Ala.—Two or three applications are necessary to destroy the successive broods of worms. On light cotton the cost exceeds the profit, and on rank cotton the injury produced by forcing through it to sow the poison is a considerable item, unless more than one-fourth of the crop could be saved by the application. If worms appear in July they produce much injury; but if in September, are regarded as a benefit.

Greene, Ala.—Kills the worm when it eats the poison. If applied on their first appearance will prove a benefit. The poison was only applied once, and killed many worms, but did not seem to stay their ravages.

Marengo, Ala.—Used it on a large scale. Paris green will certainly kill the caterpillar, if pure and properly applied, either in solution with water or in combination with flour, which must be sound.

Wilkinson, Miss.—Paris green and arsenious acid used, with some failures from improper application and impure drugs. I am convinced of the efficacy of pure Paris green and flour alone. Rows treated with the compound were fresh, vigorous, and healthy, while neglected rows were destroyed.

Noxubee, Miss.—It is much trouble to scatter the compound. Thus far no good has been accomplished.

Avoyelles, La.—Paris green was used to a limited extent in this parish, and when properly mixed and applied was a triumphant success.

Claiborne, La.—Used patent remedies and killed worms and plants. Made it weak, and killed neither worm nor plant.

Austin, Tex.—Numerous experiments made with patent remedies—effectual in destroying the worm, but retarded the growth of the cotton. An unpatented combination, increasing the amount of flour, destroyed the worms without injury to the plant. The application must be made before the bolls open, and in no case after, as if dropped on the cotton it becomes dangerous to picker and ginner.

Fayette, Tex.—Quite a number of experiments and all of them with good results, both with dry preparations and arsenical solutions. The effect does not appear at once, but is seen in from twenty-four to forty-eight hours. There has been much prejudice, but all will fall in next year; and, with a favorable season, we expect to take a bale of cotton from an acre. Cotton is cleaner where the green is used. Arsenical solution the cheapest mode.

Fort Bend, Tex.—Experiments varied and extensive, chiefly with Paris green and flour, 1 pound of Paris green to 20 or 40 pounds of flour, one to thirty being best proportion. Satisfactory; expense being about $5 per acre.

Freestone, Tex.—Mixing the green with flour or other powders has not succeeded so well as the solution, and cannot be administered so cheaply or thoroughly.

Montgomery, Tex.—Paris green mixed, either with flour, lime, plaster, or very fine sand even, applied in the morning, from daylight to an hour after sunrise, while the dew was on the plant, has been universally efficacious. Arsenic in solution has also been used, but with little effect. It burned the leaf and caused the squares to fall.

2. *Proportions and mode of application.*—The mode and time of application, both of arsenical mixtures and solutions, are indicated by a selection of representative extracts, as follows:*

Jones, N. C.—One to twenty-five. Sifted from a tin vessel having a perforated bottom and attached to a staff 10 feet long. One or two applications sufficient. Cost, $1.50 per acre.

Craven, N. C.—One to twenty-five. Shaken upon the plants from a box with a long handle when the dew was on the plants. One pound of arsenic to eight gallons of water was equally effectual. One pound of Paris green to ten pounds flour destroyed the leaves.

Richland, S. C.—One to twenty parts of flour.

Jefferson, Ga.—one to twenty-five. Killed the forms and young leaves.

Jefferson, Fla.—One to twenty-five. Should be applied at night when the wind is down and the dew is on the leaves. It must be repeated after a shower, or it will be rendered useless.

Duval, Fla.—Royall's patent used. One to twenty-eight answers equally as well and is less expensive; costing, with labor and materials, from $1.30 to 1.40 per acre.

Putnam, Fla.—Sifted upon the plant, the operator being mounted and the animal muzzled.

Butler, Ala.—Apply in August when worms first appear—two applications will suffice—1½ pounds to 8 pounds flour, 50 gallons water; or 1½ pounds green, 1 pound resin and gum arabic each, with 20 pounds of flour.

Clarke, Ala.—Used in proportion of 1 to 28 with the desired effect. Applied 6th of

*Where no other substances are mentioned, Paris green and flour by weight are understood.

August, and ten days later, (the heavy rains washed it off,) by means of a bucket with sieve-bottom. Have also used a spoonful of the poison in a bucket of water, shaken on by means of a shuck tied to a stick.

Crenshaw, Ala.—One to twenty-five, flour or lime; 1 to 40 gallons of water.

Greene, Ala.—One-quarter pound green to 30 gallons water. One hand rides down the rows on a mule and sprinkles from a watering-pot.

Hale, Ala.—One-half pound to 40 gallons water.

Marengo, Ala.—One pound in 20 used, dusted on by means of sieve when the plant is wet with dew or rain. At the same time used 1 pound in 40 gallons of water, (to an acre,) applied with fine watering-pots, when too dry for the powder to stick. Two applications will, doubtless, save the crop. The green is not soluble, but by keeping the water stirred, better results are obtained.

Montgomery, Ala.—Has been mixed in proportion of 1 pound of green to 20, 25, and 30 pounds of flour. Applied on the first appearance of the worms by means of a tin strainer.

Perry, Ala.—One pound in 40 gallons water to an acre.

Clark, Miss.—One to thirty, sifted on when worms first make their appearance in the morning, repeating in ten or fifteen days.

Wilkinson, Miss.—Treated with 1 to 30 by weight, sour flour, carefully mixed, per acre, and by means of a mosquito-netting bag on a pole, held over the plant and slightly tapped. This is done in the morning while the dew is on. The sun evaporates the moisture and the poison is glued to the leaf.

New Iberia, La.—Paris green and flour, and arsenic and lime, have each been used with equal success. They have also been used with a sprinkler. A sifter is used.

Rapides, La.—Best results from solution of arsenic in the proportion of three-quarters of a pound to 40 gallons (barrel) of water—1 barrel to 3 acres—used by means of a watering-pot.

Saint Landry, La.—One pound to a barrel of water.

Austin, Tex.—Proportion, 1 to 25, adding a little rosin and gum arabic; applied with a sieve attached to a forked stick, which is tapped as the operator moves along the row. Dust while the dew is on, walking to windward.

Comal, Tex.—Paris green 1 to 20 by weight—also used with water, 1 ounce arsenic to 1 pound water. Remedies most effectual when used in the morning.

Fort Bend, Tex.—No regular system for application. Some have used sieves, others coarse netting sacks, while dew was on, some using through the day and for the third time. Arsenic dissolved in water also used with good effect.

Freestone, Tex.—Paris green succeeds best in solution, and is administered more thoroughly and cheaply; 2 ounces to 1 pound of green to 10 gallons water, administered with a common watering-pot.

Lavaca, Tex.—Royall's patent, 1 pound green to 1 pound resin, one-half pound gum arabic, and 17 pounds flour. Two applications saved the crop when worms first appeared, and on the appearance of second crop.

Leon, Tex.—One-fourth to one-half pound arsenic in water to an acre. Sprinkled with common sprinkler.

Sabine, Tex.—One-half pound green, 10 pounds flour, 10 pounds lime, and 1 pound resin to an acre. Put three-fourths of this amount on at intervals of four weeks when the worms first appear would be the best mode.

3. *Injurious or poisonous effects.*—Nearly all returns made reference to the matter of poisoning or injury from the application, and most of them stated positively that no injurious effects were observed. Several asserted that when too liberally applied, or in too strong a solution, the leaves were spotted or killed. In Rapides Parish, La., "in some cases plants were injured and nearly killed by the Royall's mixture," and in Claiborne Parish "a patent remedy killed plants." In Avoyelles, La., "caused blooms to shed to a limited extent." In Sabine, Tex., our correspondent's stock roamed at large over the field with no injurious results. "Reports of horses and mules dying from licking the poison from the stalks" are returned from Brooks, Ga. Our correspondent in Worth, Ga., says: "Stock has been poisoned by eating the cotton, and it has made several persons using it giddy when advantage was not taken of the wind. Turkeys and chickens have been killed from eating the dead worms." It was deemed a decided advantage in Putnam, Ga., as it killed the noxious weed known as beggar's lice. There were reports from Crenshaw, Ala., of "a few cases of injury to human beings and to stock and some destruction of birds eating dead worms," but no particu-

lars were given; and a similar report from Carroll, "one or two cows killed from eating the cotton." One correspondent expresses the opinion that it will prevent the pasturing of cotton-fields after the picking is over. The Craven (N. C.) correspondent says: "No inconvenience from poisoning where the right proportions are used. The caterpillar or flock bird feed upon these worms in the same fields where the poison is strewn, and grow very fat. Sportsmen kill these birds and thousands eat them, yet have not heard of any one being injured."

4. *Means of destruction.*—Most of the returns fail to indicate the use of any other than arsenical compounds for the destruction of cotton-insects. Several declare definitely that no others have been tried. Of those which are reported the following extracts will give an idea:

Jones, N. C.—Fires or torches are of no service. Carbolic soap has been tried and believed to be good. It is used in the proportion of one gallon of soap to ten of water.

Beaufort, N. C.—Ravages stopped in one field by a flock of turkeys.

Granville, N. C.—Turkeys saved the crop.

Worth, Ga.—Ceasing to cultivate cotton for a year or two, and resting the lands, is the remedy.

Sumter, Ga.—Fires and lamps are worthless.

Jackson, Fla.—Tin lanterns of peculiar construction, also torches, have been used with success.

Gadsden, Fla.—Turkeys highly recommended. Kerosene-oil and turpentine in small quantities in water have been used with some good effect.

Orange, Fla.—Birds are encouraged, and we find it pays.

Butler, Ala.—Torches and fires, with little or no success.

Carroll, Ala.—Fires used with no effect.

Jones, Miss.—Fires will retard the progress of the caterpillar.

Noxubee, Miss.—Fires and torches in some instances seem to have done good. The best remedy is early and clean cultivation.

Madison, Miss.—Fires and lamps used with only partial success.

Clark, Miss.—Fires, torches, and small lamps used with only partial success. Would be more useful if practiced by every planter in a neighborhood, as it attracts the moths from neighboring farms.

Warren, Miss.—Early in July last sheet-iron pans, 18 by 15 inches by 2 inches deep, containing coal-tar to the depth of ¼ inch—and about four inches above the center of each pan of tar a lantern was secured—were placed on stakes something higher than the cotton-plant, set about 100 feet apart in the field, and light being placed in the lanterns at night many millers or moths were destroyed, but without perceptible relief. Earlier commencement and a more general effort in a similar direction may accomplish something in future. No poisons were tried.

Bossier, La.—Running a sweep-plow through the rows does more good than anything else. It rakes the worms off the cotton and covers them up.

Comal, Tex.—Large lamps set in pans of molasses used extensively through the county. One lamp to one hundred yards square, lighted at early dusk. Moths were collected with very favorable results.

Lavaca, Tex.—Night lights have been used. Unless universally adopted by all farmers not much benefit derived, as the light attracts from adjacent fields. Fields where lights were used have been known to be first destroyed.

CONCLUSIONS.—From the answers to the various questions above quoted the following is a summary of the conclusions:

The use of Paris green, when pure and unadulterated, mixed with flour in the proportion of 1 part of Paris green to 25 to 30 parts of flour, is of utility, and in many cases has saved the crops; that in many instances where the Paris green has failed it has been attributed to improper use or using a spurious article. Paris green or arsenic, also used with water and sprinkled over the plants, has been used with good effect, but to be of any avail the water must be well mixed up and stirred at the time of using it, as the Paris green or arsenic is only partially soluble in water, and requires to be thoroughly disseminated throughout the water, to be deposited as a slight coating of poisonous powder on the leaves, to be of any avail. When Paris green or arsenical compounds are used great care must be taken not to make the mixture too strong,

or they will kill or injure the leaves and plants. When used as a powder dusted over the plants, the plants must be wet in order to make the powder adhere to the leaves. Rains will wash the mixture away from the leaves, and it will have to be renewed after heavy showers. Some glutinous or sticky substance may be used with the Paris green and flour in order to cause it to adhere to the leaves, but it is not necessary. Sour or spoiled flour will answer as well as the best; plaster, ashes, and even dust have, in some cases, been substituted for the flour, but have not answered the purpose as well as flour. Applying the Paris green on the first appearance of the caterpillars is recommended, and as soon as possible after the second crop of worms appear on the plants also. No notice has been taken of patent insect-destroyers, as the patentees claim a private and exclusive right to use them. Only a very few cases of injury to man or beast have been observed, and even some of those cases are not well substantiated by proof. It, however, would be well to caution persons using this poison to be on the windward side when dusting or showering it on the plants, and not to let stock in to feed upon the foliage. The prejudice of the freedmen against using Paris green is now partially removed. The application of Paris green not strong enough to injure the cotton will kill the beggar's-lice weed in the rows.

One or two of the favorable accounts of the success of Paris green in certain localities must be considered, however, as occurring in the same neighborhoods where the worms mysteriously disappeared in neighboring fields *without* the aid of the poison. Fires are said by some planters to be of use in attracting and destroying the moth or miller, and by others to be injurious, as attracting moths from neighboring plantations; and it has been observed that the cotton has been very much attacked immediately around such fires afterward, as if the moths had been attracted by the fire and deposited their eggs in the vicinity. Torches are of no avail unless generally used by all the planters in a neighborhood, except when placed over pans or dishes containing some adhesive substance, and into which they fall. Great complaints have been made by planters about the indiscriminate destruction of insectivorous birds, which ought to be protected by law, as they are exceedingly useful in destroying the cotton-caterpillar. Some planters used salt-water in the proportion of a gill to a bucketful, and thought they experienced beneficial results from its use, while others plowed between the rows with pine-brush fastened to the swingle-tree in order to sweep off the caterpillars from the plants on to the ground, where they are either buried under the earth or scorched to death before they are able to reascend the plants. Kerosene-oil, cresylic soap, and other preparations have been used, but to no great extent, though with some beneficial results. Turkeys driven into the field, as in the case of the tobacco-worms in Maryland and Virginia, will quickly exterminate many of the caterpillars, and have been highly spoken of by three of our correspondents.

In many cases the correspondents consider that when the cotton is attacked quite late in the season, and after the last bolls are formed, the caterpillars are rather a benefit than injurious, as by eating off the dense foliage, the air and sunlight being admitted, the bolls that would otherwise not ripen and open are fully matured.

REPORT OF THE CHEMIST.

SIR: I have the honor to present to you the annual report of the work of the division under my charge, and before proceeding to the statement of the work accomplished it is but just that I should state that during at least four months of the year 1873 I have been without an assistant. On account of the unfortunate illness of one of my assistants, of which you are fully aware, more than one month's work was entirely lost, and an important and valuable investigation was discontinued. If, therefore, I have a comparatively small amount of work to report, I hope the cause of it may be fully understood.

Until the beginning of the last year the Department has been very much troubled with applications for analyses of minerals, ores, commercial products, &c., which had little or no bearing upon agriculture or agricultural chemistry, and it was evident that they were frequently applied for more to satisfy personal curiosity or, in many cases, to further personal speculations. Such applications we have declined, as far as practicable, and have confined ourselves to the work of making such investigations as we believed would be of greatest practical value to the greatest number of the people, and at the same time be possessed of the greatest scientific interest and importance. I have experienced the same difficulty as my predecessors, namely, the want of sufficient assistance in the laboratory, to work up all important questions which may have been presented for investigation, and have, therefore, found it necessary to make such selections as the conditions to which we are subject would admit, taking up such as were of the most immediate importance. Since the cause of agricultural chemistry may be advanced as well by devising and publishing new and valuable methods by which the results of our analyses have been obtained as by the publication of the results themselves, I have in my work endeavored to devise, as far as practicable, new and improved methods, or to modify old methods where this was necessary to insure greater accuracy in my results, and these shall be given under the different subjects considered.

The number of

FERTILIZERS,

natural or artificial, which have been analyzed during the past year has been very limited, since, on account of the large amount of work in this line, prosecuted during previous years in this Department, and of that being constantly done elsewhere, many applications for work of this kind were declined, the applicants being referred to records of analyses of materials of similar character heretofore published in our reports, or supplied with results of analyses from other sources. The few that we have analyzed are as follows:

1. A mineral fertilizer (so called) was sent by Mr. James K. Gibson, of Abingdon, Va., with a statement to the effect that he had applied it to his corn-crop, and that until the beginning of the dry weather it had produced a very marked and beneficial effect. Its composition is as follows:

Moisture, (at 100° C.)	0.100
Silica	34.655
Peroxide of iron and alumina	14.542
Phosphoric acid	0.563
Lime	22.207
Magnesia	9.614
Carbonic acid	17.448
Alkalies	Traces.
Loss	0.871
	100.000

Owing to the absence of notable quantities of phosphoric acid and potash, its value is evidently due to the amount of lime and magnesia which it contains.

2. A calcareous marl, presented for analysis by Mr. J. L. White, Iola, Marion County, Fla., having the following composition:

Moisture, (determined at 130° C.)	1. 11
Organic and volatile matters	1. 07
Peroxide of iron and alumina	1. 24
Lime	49. 92
Magnesia	2. 24
Potash	0. 04
Soda	0. 13
Carbonic acid	37. 82
Phosphoric acid	0. 70
Sulphuric acid	0. 32
Insoluble matter, silica, &c	5. 41
	100. 00

3. A calcareous marl from H. R. Pollard, Stevensville, Va.,:

Moisture. (determined at 100° C.)	0. 48
Organic matter and moisture not expelled at 100° C	3. 76
Peroxide of iron and alumina	1. 78
Lime	44. 28
Magnesia	1. 04
Potash	0. 11
Soda	0. 31
Phosphoric acid	0. 19
Sulphuric acid	0. 25
Carbonic acid	34. 83
Silica &c	12. 97
	100. 00

4. A sample of green-sand marl from E. A. Vannort, Hanesville, Kent County, Md.:

Moisture	3. 175
Organic matter	4. 475
Silica	48. 481
Protoxide of iron	6. 430
Peroxide of iron	13. 901
Alumina	10. 9944
Phosphoric acid	0. 0086
Lime	2. 116
Magnesia	3. 1638
Potassa	6. 767
Soda	0. 805
	100. 3168

This compares very favorably with marls of like character from the extensive deposits of New Jersey and other localities.

5. A sample of material found in a cave and supposed to be excrement of bats, was received from Messrs. Miller and Tancré, of Huntsville, Ala., together with the following communication:

We send you to-day, by express, a small box containing specimen of a deposit found in a cave on the plantation of Mr. B. F. Watkins, in Lauderdale County, Alabama, on the Tennessee River, about forty miles west of Huntsville. The cave has never been thoroughly explored, but is thought to be about two miles in length, with rooms opening on either side of the main entrance. It is inhabited by a countless number of bats, from whose discharges the deposit in question is formed. No correct idea can be formed with regard to the extent of this deposit, but in many places it is found to be fifteen feet deep.

By request of Mr. Watkins we send you this specimen for analysis, as he wishes to ascertain its value as a fertilizer, and the proper ingredients with which to compost it for either cotton or cereals. There is in it also a lump of niter, which also exists in a large quantity. This was worked during the war by the confederacy in the manufacture of saltpeter.

The color of the deposit is dark brown. The material is very light, and seems to consist of small scales, which are probably the remains of insects. This fact, together with the fact that the cave from which it is obtained is inhabited by a large number of bats, may be considered fair evidence in support of the theory advanced with regard to its origin.

The lump accompanying the dark sample, supposed by our correspondent to be niter, cannot be considered as such since it contains no potassa or other alkali of any account, and but a small proportion of nitric acid. On account of the presence of this latter constituent, as well as the soluble phosphoric acid, it has some agricultural value, and will be found useful in admixture with the other material. When taken from the box it was quite moist, and when cut through, the section presented a white and yellowish mottled appearance. On exposure it dried, forming a tolerably hard mass, which crumbled upon application of slight pressure, and when crushed it was very fine and pulverulent. From the results of analysis given below it seems to be an accumulation of siliceous clay.

The analysis resulted as follows:

Moisture	12.800
Organic matter	9.700
Silica, insoluble in chlorhydric acid	42.290
Silica, soluble in chlorhydric acid	9.410
Phosphoric acid, soluble in water	0.2277
Phosphoric acid, insoluble in water	1.4673
Peroxide of iron	0.1169
Alumina	19.88
Lime	1.6377
Magnesia	2.09
Nitric acid	0.0823
Sulphuric acid	Trace.
Soda	Trace.
Carbonic acid	Trace.
	99.7019

The dark-brown material has a greater agricultural value, since it contains a much larger quantity of the constituents which are immediately available for plant-food. It may be used with advantage in the raw state, in favorable quantities, without composting, for either cotton or cereals; but in cases where it may be more convenient for application it may be used with any kind of composting materials whatever.

The analysis of this material gave the following results:

Moisture	11.60
Insoluble silica	30.81
Soluble silica	3.18
Insoluble organic matter { containing 3.72 per cent. of nitrogen = 4.52 per cent. of ammonia }	28.687
Soluble organic matter	10.573
Free ammonia	Trace.
Phosphoric acid, soluble in water	1.305
Phosphoric acid, insoluble in water	1.5016
Peroxide of iron	1.428
Alumina	3.21
Lime	4.11
Magnesia	3.11
Soda	0.312
Nitric acid	0.122
	99.9486

6. A muck from near Southington, Conn. Mr. Luman Andrews observed with regard to it that when thrown out in heaps there soon appeared upon the surface a white coating or efflorescence consisting of small white scales or crystals. He sent a sample of the muck to this

Department in order that the composition of this coating might be determined. On account of the very small amount of the coating itself upon the sample sent us it was impossible to make a complete analysis of it. It is therefore difficult to state positively what compound it may be, but from the complete analysis of the sample sent us it appears to be some soluble sulphate. The analysis resulted as follows:

Moisture, (determined at 100° C.)	3.77
Organic matter* and moisture not expelled at 100° C	28.31
Protoxide of iron	2.40
Peroxide of iron	Trace.
Alumina	3.32
Lime	1.29
Magnesia	1.01
Potash	0.41
Soda	0.14
Phosphoric acid	0.10
Carbonic acid	Trace.
Sulphuric acid	1.15
Silica, &c	58.10
	100.00

*Containing 1.09 per cent. nitrogen.

The residue remaining after removing the organic and volatile matters, by incineration, is very fine and pulverulent.

ANALYSIS OF WINES.

During the month of April, 1873, we were led to make some examinations of wines with a view to the determination of a means of distinction between the alcohol of fermentation and that of distillation, and the amounts of these constituents which any given wine contains. Our attention was drawn to this subject by the receipt, from Hon. J. W. Douglass, Commissioner of Internal Revenue, of a sample of "Sonoma Sparkling Champagne," manufactured by J. N. Blum, of New York State, and seized in New Orleans according to the law providing for the taxation of all wines of American manufacture containing more than 5 per cent. of absolute alcohol produced by distillation. The object of the examination in this case was, therefore, to determine whether the wine was produced by the natural process of fermentation or by the use of brandy or other alcoholic fluids, thus placing it within the limits of the above-mentioned law. The only reliable method for making such distinctions consists in determining the total amount of alcohol which the given wine contains, and considering all above a certain per cent., generally 12 to 14, which is known to exist in a normal wine, as alcohol of distillation. This is, of course, only approximate, on account of the variation in the composition of different wines.

Other experiments for the determination of the purity of wines were made, with a view to proving the presence of adulterations, but they gave negative results. According to Beyse, Bolley, Neubauer, and other chemists who have devoted years to the study and investigation of wines and their manufacture, the separation and determination of the two varieties of alcohol spoken of is impossible. In the course of our investigations we procured, for comparison, a specimen of "Imperial champagne," manufactured by the American Wine Company of Saint Louis, and have made complete analyses of the two, obtaining the following results, in parts per thousand:

No. 1.—*"Sonoma Sparkling."*

Alcohol by weight	107.7
Alcohol by volume	133.0

Extractive matter	102.1
Ash	1.9
Acid, (calculated as free tartaric)	6.5

No. 2.—"*Imperial.*"

Alcohol by weight	95.5
Alcohol by volume	122.0
Extractive matter	129.8
Ash	1.4
Acid, (calculated as free tartaric)	5.5

OPIUM FROM NORTH CAROLINA.

Many experiments have been made with varied success in the cultivation of the poppy and the production of opium in different parts of this country, and during the past year Mr. F. J. Kron sent to this Department a communication accompanied with a specimen of opium produced near Albemarle, Stanly County, North Carolina, which presented a very fair appearance. The following is Mr. Kron's communication:

Some four years ago seed of the opium-poppy, originally derived from Turkey, was obtained from the Department of Agriculture and has been experimented with here ever since. The results have demonstrated that both our climate and our soil are well adapted to the production of either poppy-seed for the manufacture of poppy-oil, (*huile d'oliette* of the French,) or of opium as good as can be made anywhere. The results have ever shown that the plant here is decidedly hardy, contrary to what is stated concerning it in the report of our consular agent in Smyrna, in 1869, where it is represented as being tender to frost. Here, where the temperature some years falls below zero, the seed sown, as in Asia Minor, in the fall vegetates freely and passes the winter safely, to present, in the spring, plants of remarkable vigor, provided with heads which are numerous and large, far superior to the plants raised from seed sown in the spring. The yield, however, has not thus far been abundant enough to make the culture remunerative. An idea may be formed in that respect from the fact that only 216 grains of opium were obtained from 220 heads. But the quality of the opium produced is something superior to anything we can obtain in commerce. It is all opium; none of the filth and seed which often constitute three-fifths of the bulk of the opium sent to us here. In medicinal properties it will not disappoint the practitioner, but present him with all that is expected from the greatest of boons of Providence to suffering humanity.

The sample of opium sent seemed free from foreign matters, was well dried, and was quite hard and resinous. When pulverized and subjected to analysis, the air-dried product yielded 5.01 per cent. of pure morphine. This proportion of morphine is rather low; yet it is nearly equal to that of many varieties of opium from India. In order that this result may be compared with results of analyses of opium from other localities, we give below a table of results obtained by different analysts.

Locality.	Percentage of morphine.	Analyst.
Smyrna	12 to 14	Guibourt.
Egyptian, (dry)	5.8 to 6.6	Guibourt.
Egyptian, (undried)	6 to 7	Merck.
East India	5.3 to 7.7	Guibourt.
Persian	11.37	Guibourt.
Algerian, (white poppies)	1.52 to 8.57	Aubergier.
Algerian, (red poppies)	10.37 to 11.23	Aubergier.
Algerian, (purple poppies)	14.71 to 17.83	Aubergier.
Erfurt, (blue poppies)	16.6 to 20	Blitz.
Erfurt, (white poppies)	6.85	Blitz.
French, (dried,) maximum	22.9	Guibourt.
French, (dried,) minimum	14.8	Guibourt.
Vermont, (Addison County)	15.75	
California, (Marin County)	5.75	

In the determination of morphine in the North Carolina specimen, the method of Proctor gave the most satisfactory results: 20 grams of the dry pulverized opium were rubbed with repeated portions of water until finely divided, and allowed to digest twelve hours in about six times their weight of water, when the whole was removed to a filter and washed with water until the washings were completely colorless and tasteless, the fluids thoroughly mixed and divided into portions representing 10 grams each for duplicate determination.

The solution thus obtained is treated with solution of subacetate of lead as long as precipitate forms, the precipitate being separated by filtration and well washed. To the filtrate add dilute sulphuric acid, drop by drop, to separate the excess of lead as sulphate, filter and evaporate the fluid to small bulk at a low temperature, mix with an equal volume of alcohol, filter, and treat the filtrate with 15 to 20 grams of ammonia sp. gr. .960, mixed with an equal volume of alcohol. The alcoholic solution of ammonia is divided into two portions, which are added half an hour apart, after which the fluid is allowed to stand twenty-four hours. The morphine, which separates in distinct crystals, is collected on a weighted filter, washed with dilute alcohol and freed from a small quantity of narcotine which may be present by washing with ether. The remaining crystals of morphine are carefully dried and weighed.

SOIL ANALYSES.

It is well known that this Department has heretofore been the recipient of large numbers of applications for analyses of soils, but on account of the amount of time required for the purpose, and the low value which must generally be ascribed to this branch of chemical analysis, as it is usually practiced, we have found it necessary to decline nearly all of them, confining ourselves in this particular to the examination of only such soils as are possessed of properties immediately injurious to crops, these properties infecting the soil of a considerable section of country. Heretofore great difficulty has been experienced by analysts in fixing upon a method by which the absolute fertility of a soil may be determined, or at least one which will afford results indicating a degree of fertility that will correspond with the experiences of actual practice, and founded upon the amount of the crops produced from it. Many soils containing a considerable quantity of organic matter in the form of *humus* have the mineral elements of plant-food locked up in organic combinations, which are insoluble in water, and, therefore, unless these combinations be acted upon by other materials having a stronger solvent power, and which may at the same time be readily taken up by the plants, they must lie dormant in the soil. In the decomposition of the nitrogenous matter of the soil carbonic acid and ammonia are formed. Alkaline carbonates are known to have a solvent action upon the *humus* of the soil, and these substances are the materials which do the most work in supplying plants with nutritive principles. It is therefore evident that when we make use of the stronger acids in our analyses, we go further than the forces brought to bear in nature will warrant. Mons. L. Grandeau has thoroughly developed this idea in his investigations upon the black soils of Russia, and has found that in nearly all cases the sample of soil to be analyzed should be exhausted with a dilute solution of carbonate of ammonia, since, he says, this latter re-agent plays the part, first, of an acid, and then of a base, and that the intervention of a strong acid, such as chlorhydric, is unnecessary. This Department has lately had an opportunity of making a practical application of M. Grandeau's ideas and of his method of soil analyses.

During the past year we received, through Lieut. Col. S. C. Lyford, of the Ordnance Office of the War Department, a sample of black soil from the plantation of Mr. P. Kemble Paulding, on Brae's Island, Beaufort County, South Carolina. The sample in question had every appearance of being decidedly fertile, but, as far as the cotton-crop is concerned, experience has proven that quite the opposite is the case, as may be seen from Colonel Lyford's communication. He says:

It having been found impracticable to raise cotton from this soil, Mr. Paulding desires to know what constituents are present which prevent the cultivation of such a crop. As a great deal of such soil is found on the various islands of the South Atlantic coast, a complete analysis will be of great interest to the planters of that section.

In compliance with the suggestion of Colonel Lyford, a qualitative examination of the soil was made, revealing the presence of protosulphate of iron; and this fact may be considered sufficient cause of failure in the production of cotton. A complete quantitative analysis has, however, been prosecuted according to Grandeau's method, and the following statements indicate the results obtained.

Preliminary analysis of soil gave:

Moisture	4.75
Organic matter	14.24
Inorganic matter	81.01
	100.00

Specific gravity of soil, 1.14.

The aqueous extract of the soil has an acid reaction.

The soil itself is of very fine texture, free from stones, it is very compact, and becomes very hard when dried. When treated with a dilute solution of carbonate of ammonia it yielded an extract which, when evaporated to dryness and strongly heated, left a residue which contained, in 100 parts, the following constituents:

Organic matter	86.950
Silica	1.878
Sulphuric acid	3.421
Magnesia	1.956
Lime	1.434
Peroxide of iron	.913
Phosphoric acid	.619
Potash	2.909
	100.080

One hundred parts of the mineral matter remaining in the soil, after exhausting with carbonate of ammonia, contain:

Insoluble silica, sand, &c	78.100
Soluble silica	.205
Lime	.380
Magnesia	.200
Manganese	.491
Alumina	16.843
Peroxide of iron	2.970
Phosphoric acid	.190
Sulphuric acid	.677
	100.056

Collecting the above results, we find that 100 parts of air-dried soil contain:

Moisture			4.750
Matter soluble in carbonate of ammonia.	Silica	0.0432	
	Sulphuric acid	0.0786	
	Magnesia	0.0450	
	Lime	0.0330	
	Phosphoric acid	0.0142	
	Peroxide of iron	0.0210	
	Potash	0.0669	
	Organic matter	2.0000	
			2.3019
Matter insoluble in carbonate of ammonia.	Insoluble silica, sand, &c	62.93	
	Soluble silica	0.165	
	Lime	0.307	
	Magnesia	0.161	
	Peroxide of manganese	0.395	
	Peroxide of iron	2.390	
	Alumina	13.594	
	Phosphoric acid	0.153	
	Sulphuric acid	0.546	
	Organic matter	12.240	
			92.781
			99.8329

As we have seen above, the specific gravity of the soil is 1.14. A cubic foot of it therefore weighs 71.42 pounds, and a stratum of soil, one foot in depth, extending over one acre, will contain 3,100,055 pounds. This amount of soil is capable of yielding materials immediately available for plant-food as follows:

	Pounds.		Pounds.
Silicia	1,331	Magnesia	1,395
Peroxide of iron	651	Lime	1,023
Phosphoric acid	440	Organic matter	6,201
Potash	2,077		

It will therefore be seen that the soil in question contains sufficient material to satisfy the immediate demands of a cotton-crop, although the quantity may be somewhat limited. The main trouble is undoubtedly due to the fact of the existence of proto-sulphate of iron in the subsoil, and probably free sulphuric acid also. Both of these substances have a poisonous influence upon plants. The planters of the South Atlantic coast, who have this difficulty to contend with, must necessarily adopt some means to remove this salt of iron, and to neutralize the free sulphuric acid. The most economical method by which this may be accomplished is a copious application of lime. In case of the soil in question, about 150 bushels of lime per acre will probably be required. I would also advise thorough underdraining where this is deficient, and it is probable that this is the case wherever the difficulty in question exists.

PROXIMATE ANALYSIS OF CEREALS.*

This may justly be considered one of the most difficult and tedious processes in analytical chemistry. It not only requires patience but often yields results which fail to produce the satisfaction desired. To reduce the difficulties to a certain extent, and to devise a method which would yield satisfactory results and insure economy in time and expense, was, in part, the object of an investigation extending through a period of about two months. In this we were aided considerably by the experience of former chemists of this Department.

Since the separation of the several proximate principles depends upon

*This of course applies more particularly to analyses of corn, but may, with slight modifications, be applied to any cereals whatever.

the action of different solvents, the work of devising a method of effecting it obviously consists in the selection of such as are best suited to the purpose, as well as the best means for applying them. In the selection of solvents, attention must be paid to their *wetting* powers as well as their power of solution. Thus ether will dissolve a larger proportion of oil than bisulphide of carbon, but the latter being more penetrating will extract the oil from the meal more readily than the former. We have therefore chosen as solvents, to be used in the following method, bisulphide of carbon, alcohol of 85 per cent., water, and dilute acid and alkaline solutions.

The best mode of extraction of the different principles with solvents is by percolation, and this operation may be very materially aided by the use of the Bunsen pump. In order that the residues may be dried and weighed without destroying the filter, Monroe's porous earthenware cones, 1½ inches in diameter, are used, and these are fitted into glass funnels by means of a ring of rubber tubing.

The material having been carefully and finely pulverized, take two samples of 2.5 to 3 grams each, heat at 130° C. until constant weight is obtained, in order to determine the moisture. Then place them upon the porous cones and determine the oil by extraction with bisulphide of carbon. The residue after this extraction, as after each succeeding one, must be dried at 130° C. until constant weight is obtained. The oil having been removed, the two samples are treated for zein, sugar, and gum, as follows: Let the cones be numbered respectively 1 and 2. Treat the contents of No. 1 with alcohol of 85 per cent., which will remove the zein and sugar. After having dried and weighed it, treat the residue with water to remove the gum; dry and weigh. Treat the contents of cone No. 2 with water to remove the gum and sugar; dry and weigh. The amounts of zein, gum, and sugar may now be calculated as follows:

Treatment of No. 2 with water=gum and sugar.
Second treatment of No. 1=gum.
First treatment of No. 1=zein and sugar.
Gum + sugar — gum=sugar.
Zein + sugar — sugar=zein.

The substance having been treated as above is transferred from the cone to a beaker 12 inches high and 3 inches in diameter, and boiled for two hours with 200 c.c. of water containing 5 per cent. of sulphuric acid. As the water evaporates it must be supplied. After boiling, the beaker is filled with hot distilled water, the residue allowed to settle, and the clear supernatant fluid is drawn off as completely as possible, by means of a siphon, without disturbing the residue, which is then transferred to the filter, washed with boiling distilled water, dried, and weighed. The loss denotes the amount of starch, and the residue consists of albuminoids and cellulose. These may be separated by treatment with water containing 5 per cent. of caustic alkali, which will remove the former, leaving the latter as a residue.

The ash is determined by taking another sample of 2.5 to 3 grams, and incinerating it in a platinum crucible. The mineral matter is then deducted from the various principles with which it may have been removed in the process of extraction. We have determined by experiment that extraction of the different substances removes the following percentages of the whole amount of mineral matter present for each of the constituents. Thus the amount removed with—

	Per cent.
Zein	7.5
Albuminoids and cellulose	10.5
Gum	37.6
Starch	44.4

The nitrogen should be determined as a check upon the zein and albuminoids.

A great deal of time must necessarily be lost in working the above method, we prefer the following, which, although it involves the same principles, may be prosecuted in much less time:

For this method weigh out five samples of 2.5 to 3 grams each, place them upon porous cones which have been previously washed and ignited, and numbered respectively 1, 2, 3, 4, and 5, and heat at 130° C. until constant weight is obtained. Treat the contents of cone No. 1 with bisulphide of carbon, dry and weigh. Before weighing, the residues must be well dried at 130° C. Loss in weight of cone and contents = moisture and oil.

Treat the contents of cone No. 2 with bisulphide of carbon and alcohol of 85 per cent. consecutively, without removing the cone from the filtering funnel. After this is done dry and weigh. Loss=moisture, oil, zein, and sugar. In the same manner treat the contents of cone No. 3 with bisulphide of carbon and water. Dry and weigh. Loss=moisture, oil, gum, and sugar. Treat cone No. 4 with bisulphide of carbon, alcohol of 85 per cent., and water. Loss=moisture, oil, gum, sugar, and zein. Treat cone No. 5 in the same manner as No. 4, and, without drying, transfer the contents of the cone to the tall beaker described in the former method, and proceed with the treatment for starch as described above. After the starch is removed, the albuminoids, cellulose, and mineral matter are determined as in the preceding method.

We give below the composition of two varieties of Indian corn determined by the above method. The main object of the analyses was to determine the differences in the composition of various kinds of corn found in the markets, and whether these differences were sufficiently great to influence their market value. Our time being limited, two varieties of gourd-seed corn were chosen: a yellow corn grown upon the farm of the Commissioner of Agriculture in Pennsylvania, and believed to be a fair representative of a greater portion of the corn found in the northern and western markets, and a white variety grown upon the Eastern Shore of Maryland, believed to be a fair representative of that of the southern markets. No. 1 is the analysis of the yellow corn from Pennsylvania, and No. 2 that of the white corn from Maryland.

No. 1.

	Undried substance.	Dry substance.
Moisture	8.87	....
Oil	5.17	5.67
Sugar	1.10	1.21
Gum	1.23	1.35
Zein	1.98	2.17
Starch	70.66	77.54
Albuminoids	7.94	8.71
Cellulose	1.72	1.89
Ash	1.33	1.46
	100.00	100.00

No. 2.

	Undried substance.	Dry substance.
Moisture	8.03	....
Oil	5.61	6.10
Sugar	2.45	2.66
Gum	0.97	1.06
Zein	1.45	1.58
Starch	70.36	76.50
Albuminoids	8.36	9.09
Cellulose	1.53	1.66
Ash	1.24	1.35
	100.00	100.00

HOMINY-OFFAL.

The above method of analysis has also been applied to the determination of the composition of a sample of offal from the hominy mills of Messrs. George R. Hill & Co., Alexandria, Virginia. Accompanying the sample was the following communication:

Recent experiments by farmers in Connecticut and New Jersey having determined that corn-meal is a most valuable fertilizer, (equal in some cases to guano,) we have the honor to forward this day, by express, a specimen of the offal from our hominy mills, composed principally of the *hearts* or *germs* of the corn, and hence believed to be the more valuable, (as the phosphatic element so largely predominates,) and respectfully ask that you will cause an analysis of the same to be made at an early day.

In response to the request embodied in the above communication, a complete analysis has been made, the following results having been obtained:

One hundred parts of the material contain:

Moisture			6.38
Organic matter	Oil	7.50	91.4875
	Sugar	1.50	
	Gum	2.4982	
	Zein	1.8400	
	Starch	65.9732	
	Albuminoids	6.1961	
	Cellulose	5.9800	
Inorganic matter	Silica	0.1479	2.1319
	Lime	0.0797	
	Magnesia	0.1014	
	Peroxide of iron	0.0424	
	Phosphoric acid	0.9698	
	Potassa	0.6237	
	Soda	0.1670	99.994
Nitrogen in organic matter		1.1203	

On comparing the composition of the organic matter with the analyses given above, it seems from the large portion of cellulose that the material contains a considerable quantity of the outer shell or *testa* of the seed, and to this may be due the increased percentage of mineral matter, and especially phosphoric acid and potash. Deveau having shown that the thin layer just inside the *testa* of wheat contains a peculiar nitrogenous principle which also contains a large quantity of phosphoric acid, the same may be true concerning the corn.

One hundred parts of mineral matter contain

Silica	6.937
Lime	3.729
Magnesia	4.756
Peroxide of iron	1.988
Phosphoric acid	45.489
Potassa	29.251
Soda	7.834
	99.984

We find that the quantity of ash amounts to 2.13 per cent., making the total amount of phosphoric acid about .97 per cent., and potassa about .62 per cent. Comparing these figures with those found in the analyses published by Wolff,* we find that the average amount of ash found in corn is about 1.40 per cent., making the total amount of phosphoric acid in the grain about .66 per cent., and potassa .39 per cent. This shows that in the hominy-offal there is an increase of but about one-third in the amounts of these constituents, and when we calculate the value of the material according to the standard of commercial fertilizers, and admitting that the phosphric acid, potash, and nitrogen are all available as plant-food, it would be $3.70 per ton of two thousand pounds. Now, when it is so easy to procure fertilizing materials in a much more concentrated condition, at the same rates, it is quite evident that it would not be profitable to make use of the material in question as a fertilizer. But if we consider its value as feeding-material, upon comparing the above analysis with that of the analysis of white corn grown upon the Eastern Shore of Maryland, we see that the material difference is not very great. The total amount of cellulose and mineral matter, 8.11 per cent. in the former and 2.77 per cent. in the latter, would not make a difference of more than two or three dollars per ton in their value, even if we admit that these constituents are valueless for this purpose. So that when the price of corn-meal averages from $35 to $40 per ton, it is plain that it would be much more practical and economical to make use of the hominy-offal as feeding-material for cattle than for the purpose indicated by our correspondent.

TANNIC ACID, ITS DETERMINATION, AND THE PERCENTAGE FOUND IN SOME WOODS OF THE SOUTHWEST.

All analysts who have had any experience in making determinations of tannic acid in different materials can, doubtless, very well appreciate the difficulties which have heretofore been met in securing results for which complete accuracy can be claimed, on account of the unsatisfactory character of the methods which have thus far been employed. Fully appreciating these difficulties myself, I have endeavored to devise a method which would, in a measure at least, remove the difficulties in question, and at the same time be free from all complication which might have a tendency to vitiate the results. Probably the most convenient method given in the works on chemical analysis for making these determinations is that of Löwenthal, described in Fresenius' Quantitative Analysis, fourth English edition, page 673, depending upon the oxidation, with a standardized solution of permanganate of potassa, of tannic acid and sulphindylate of potassa, and decoloration of the latter by means of this reaction.

In this method the tannic is extracted from the material with water, and in its use, therefore, there is great danger that the results may be vitiated by the presence of gum, sugar, &c., which are soluble in water, and which may also be oxidized at the expense of the permanganates of potassa, and it was with this difficulty that I was called upon more par-

*Aschen-Analysen, page 36.

ticularly to contend. In one of the varieties of wood I have examined, gum, as well as some coloring matters soluble in water, are present in considerable quantities. These substances are, however, to a great extent, insoluble in sulphuric ether, while the tannic acid is quite easily soluble in this menstruum. I have therefore made use of it in my analyses. My method is as follows: After the material to be examined has been finely pulverized by grinding in a steel drug-mill, and thoroughly dried, it is digested several days with about twice its volume of sulphuric ether, the solution decanted, and the residue well washed with ether as long as anything may be removed. When this operation is complete, the solution and washings are united, and the ether removed by distillation. It may be collected by condensation for further use. The residue remaining from this distillation is treated with water until the final washings fail to produce any coloration with salts of iron, the entire solution thoroughly mixed and made up to a given volume. The solution thus obtained may contain very small quantities of coloring matter, which are seldom sufficient to be taken into account, but it is completely free from many of the troublesome impurities found in solutions made by extracting with water directly from the material.

Very nearly the same method has been applied by Julius Löwe * to the preparation of pure tannic acid from sumac. For this purpose he, however, makes use of acetic ether, and reverses the treatment; that is, he exhausts the material with water, and removes the tannin from the solution by agitation with acetic ether, from which it is said the tannic acid may, by distillation of the ether, be obtained in a pure state. He recommends the use of acetic ether on account of its being less inflammable than sulphuric ether.

My attention was particularly directed to this subject by the receipt of samples of the wood of mesquite, (*Algarobia glandulosa*,) Osage-orange, (*Maclura aurantica*,) and live-oak, (*Quercus virens*,) from Mr. J. M. Wilson, Seguin, Guadalupe County, Texas. It was desired that the comparative value of these woods as tanning materials be determined, since it is believed that they contain considerable quantities of tannic acid. The different parts of the woods, which had been previously air-dried, were carefully separated and finely pulverized. They were then subjected to digestion with twice their volume of sulphuric ether for ten days in closed flasks. The solution was at the end of this time decanted and the method above described was followed throughout.

The analyses resulted as follows:

	Percentage of tannic acid.	Percentage of other material separated by ether, insoluble in water.
Live-oak, white wood	0.30	0.90
heart wood	0.125	2.505
Mesquite, heart wood	6.21	0.60
white wood	0.50	6.70
bark	0.50	1.84
Osage-orange, heart wood	5.87	6.93
white wood	0.30	4.90
bark	0.10	13.10

* Fresenius, *Zeitschrift für Analytsche Chemie*, t. xii, p. 128.

It will be seen from the above table that the heart woods of the mesquite and Osage-orange contain tolerably high proportions of tannic acid; nearly as high, indeed, as many varieties of barks used in tanning, and in the Southwest, where these trees grow abundantly, there is no doubt that they may be found of great value in this branch of industry. The live-oak contains so small a percentage of tannic acid that it will be found of little value. There was extracted from the Osage-orange a yellow resinous coloring matter, soluble in ether and caustic potassa, which we have not yet examined, but which we shall at some future time make the subject of an investigation. It is possible that it may be found useful as a coloring matter.

Other investigations are being carried on which must be reported upon hereafter. We hope to be able to obtain from them important and valuable results.

WM. McMURTRIE.

Hon. FRED'K WATTS,
Commissioner.

MICROSCOPIC INVESTIGATIONS.

BY THOMAS TAYLOR, MICROSCOPIST.

HAWTHORN-BLIGHT.

RŒSTELIA LACERATA, TULASNE; ÆCIDIUM LACERATUM, GREV.—Greville, in his Scottish Flora, p. 209, vol. iv, describes this fungus as it was known in 1826. He says that it is found on the nerves and petioles of the leaves, on the fruit, and even on the young branches of the hawthorn (*Cratægus oxyacantha*) in summer and autumn everywhere; and M. C. Cooke observes that it is found on the under surface of the leaves and on the petioles and fruit of the hawthorn, and is common from May to June in the United States.

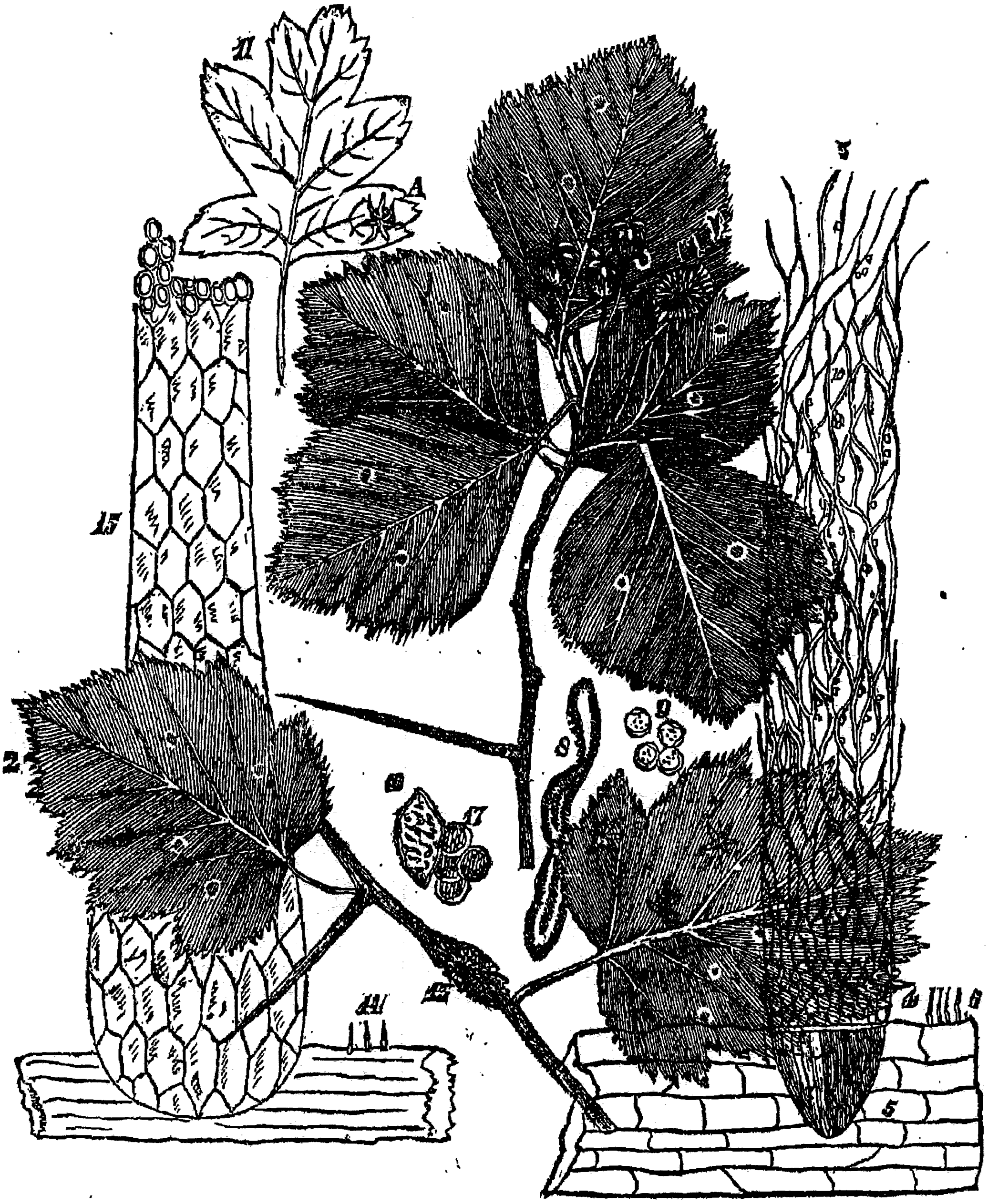
My attention was called last year to the prevalence of this fungus on the hawthorn-plants on the grounds of the Department during the months of July and August. This year it has also appeared. I first observed its presence in the month of July, although it may have appeared in June preceding. At this time, September 20, the fungoid forms are decaying. Nearly every species of the hawthorn is affected, especially *C. punctata* and *C. tomentosa.*

The evergreen hawthorn-plant,* *C. pyracantha*, Pers., seems not to be attacked by any species of fungus of the order *Æcidiacei*. Judging from my observations, I deem it an error to suppose that *Ræstelia lacerata* attacks either the branches or fruit of any variety of the hawthorn. We have many varieties of the hawthorn growing on the grounds of the Department, but in no case have I found *Ræstelia lacerata* on their fruit or branches. This species is confined to the leaves in every instance, and the petioles thus far are exempt from its attacks. On making my first observations and dissections of the orange-colored fungus, seen so frequently on the branches and fruit of hawthorn-bushes, I was much disappointed on finding that the color, structure, &c., of the peridium and spores did not agree with that given by mycologists; but on making search to ascertain if any other similar genus or species of the order *Æcidiacei* existed on the hawthorn *C. oxyacantha*, or on any of the

*A shrub spontaneous at Washington and near Philadelphia. Isaac Martindale, (Adv. from Europe.)

numerous varieties of this hedge-plant, with the view of accounting for the discrepancy, I found, on turning up the leaves having orange spots on their upper surface, true peridia (sacks) of *Rœstelia lacerata*, Tul.; *Æcidium oxyacanthæ*, Pers. Under a power of about 90 diameters the general character of the peridia is seen. They are densely aggregated, elongated, submersed, pale-brown, irregularly torn. The sporidia are copious, thus far agreeing with Greville's description. The circular spots on the leaves, Nos. 1 and 2, (Fig. 11,) indicate the general points of

Fig. 11.



growth of this fungus. I find it frequently on the leaf-ribs and terminal points of the leaves, and very often dispersed over the smooth parts of the leaf; sometimes, although rarely, the peridia are on the upper surface of the leaves. 3 represents the peculiar formation of their structure, which, when matured, resembles net-work. At the juncture of the leaf (see 4) the cells of the peridia are nearly round; at 5, oblong. From 3 to 4 the cellular structure is of a light Vandyke brown; at 5, a pale yellow. I am aware that the structure of the peridia, as described by me, varies

in some respects from that by Greville and others, which shows the importance of photographing objects so minute. I have preserved sections of these for future use. 6 represents the appearance of the peridia as seen by the naked eye; 7, their general arrangement and their groupings on the leaves; 8, three cells, showing the parts of which the peridia are composed, being magnified about 125 diameters. Greville states that it is probable that these forms are not really cellular, according to the acceptation of the term, in the higher orders of plants as has been supposed, but are at present *sui generis*, and require further investigation. Their mode of attachment to one another certainly differs from vegetable cellular structure in general; but that they are cellular and capable of being filled with water, any microscopist may satisfy himself; for in mounting by the wet process a portion of the liquid frequently fills the cells, giving their centers a dark shade.

The two lower cells of 8 represent them so filled. The upper cell represents the appearance of an empty one; 10, the openings or meshes; 11, a leaf of a variety of *C. oxyacantha*. On one of its lobes, at A, is represented a cluster of peridia of *Rœstelia lacerata;* 12 and 13 represent the peridia of a species of *Æcidium*, heretofore undescribed as a parasite, on the hawthorn, and one which has been confounded with that on the leaves; 14 represents the peridia as they appear to the naked eye; 15, a very highly magnified view of one of them, the cells of which are magnified 125 diameters; 16, one of the cells somewhat more highly magnified. They are not always regular in construction, although generally of the form given. They separate easily from one another by slight friction. 17 represents spores* of an orange-color, with which the peridia abound, and which consist of at least three parts: a transparent outer cell, an inner cell, and an orange-colored protoplasm inclosed in it, and containing germinal matter in the form of dark spots. The spores are magnified about 125 diameters.

All standard works on mycology represent *Rœstelia lacerata* as the only fungus of the order *Æcidiacei* that attacks hawthorn-plants; but judging from my investigations, it holds a secondary place. So conspicuous are the species of the two genera on them, the one on the leaves, the other on the branches and fruit, that the naked eye can distinguish the difference. That on the leaves appears of a brown color. Owing to the transparency of the cells of the peridia, the brown coloring-matter of the protospores may be seen through them, while that on the fruit and branches appears of a rich orange, owing to the color of their protospores. Although of the same order they differ in genus and species.

It is of much importance to ascertain as far as possible the conditions of growth favorable or unfavorable to this order. Its presence on plants is highly destructive to them, and has proved one of the most serious obstacles to the cultivation of the hawthorn as a hedge-plant in the United States. Forty-seven species of *Æcidium* and three of *Rœstelia* are reported by M. C. Cooke. In relation to the ravages of this order of fungi P. H. Foster, proprietor of Babylon nurseries, Babylon, Long Island, writes to the Commissioner of Agriculture, on the 1st of August last, as follows:

> I send you a specimen of a disease which occurs on some American white-ash trees, which I imported from Flushing, New York. I have noticed the disease on them during the last two seasons. It first makes its appearance early in the season on the leaves, and finally attacks the young wood, as may be seen on the specimens inclosed. It is evidently of fungoid origin. I have many thousands of plants of American white-ash, from two to three years old, planted in my nurseries, none of which are affected

* Protospores they should be called, because, in fact, they germinate, and on the threads thus produced the true spores or fruit are borne.—*Cooke.*

with this disease. I have also some European ash, which appear to be very susceptible to it. I wish to obtain a remedy. The loss of so valuable a timber-tree would be too great for our country to bear.

The Department will at an early day commence a series of experiments, having relation to the best mode of treatment of plants affected with this fungoid form of disease. The results of the experiments will be published in the monthly reports.

POTATO BLIGHT AND ROT.

Some eminent chemists, such as Dr. Lyon Playfair, believe that the potato-plant, when healthy, is not subject to attacks from fungi. In a lecture delivered by the Doctor before the Royal Agricultural Society of England, December 9, 1845, he remarked that "much had been said and written with regard to the source of the disease, and since minute fungi had been assigned as its cause, potatoes, apples, and other fruits had been inoculated with fungus spores, and had become diseased; but if there was not some previous disease in the potato itself, how was it that some varieties of potatoes escaped while growing in the immediate vicinity, while others were attacked?" The disease, he believed, arose from structural or chemical causes.

When a decayed potato was examined it was found that the diseased spots were always in the region of the spiral vessels, whose function it is to carry air into the tissue of the plants. He believed the disease originated in the oxidation of the tissue. The Rev. M. J. Berkeley, the leading mycologist of England, on the other hand, contends that the fungus *Botrytis infestans*, or, as now classed under the new genus, *Peronospora infestans*, will attack the healthy tubers; but the question arises just at this point, what means have we of ascertaining the perfectly healthy structure and chemical state of tubers? Every farmer plants what he deems sound tubers, yet, in the majority of cases, since 1845, the crop during very moist seasons has been more generally affected than it was prior to that date.

The severity of attacks of fungi on plants will depend in some cases on the density of their organic structure and the solubility of their nitrogenous matter. The nitrogenous principle of potatoes, for example, is soluble in water, that of turnips nearly insoluble. The former, therefore, ferments more readily than the latter. The leaves of a healthy peach-tree, when placed in a moist atmosphere at about 75° F., resist fungoid fermentation for months, while those of a peach-tree affected with the "yellows," placed under the same general conditions, will quickly ferment and become covered with the fruit of the fungus mucor. The first possess an antiseptic property, the second are deficient in it. If two blocks of wood, one of box-wood and the other of soft pine, are placed in a fungoid solution, the first will resist the action of the mycelium for a long time because of its density, while the second will quickly decay. The first absorbs very little water, the second a great deal. A certain amount of moisture is always necessary to the growth of fungi. The presence of an excess of water is highly favorable to the growth of the common molds and some other forms of fungoid plants.

In years previous to the noted potato-rot of 1845, the average amount of water found in healthy potatoes, according to Professor Playfair, was 72 per cent.; that of unhealthy tubers since that date, 80 per cent. The tendency to ferment is therefore increased. It was observed by Professor Playfair, in his lecture alluded to, that a peculiar state of the weather had been observed all over the north of Europe where the disease had been seen, as well as in America. The wide-spread use of

the potato as an article of diet, especially among the laboring classes throughout Europe, must have led to the extensive planting of diseased potatoes in 1846, because healthy seed could not be found. Indeed, Professor Playfair, in his second lecture of the 10th December, 1845, recommends "the planting of diseased potatoes as seed rather than none." He further states that there was no prospect of obtaining healthy seed from abroad, and that he had permission of the late government authorities for stating that this was the result of their consular returns. The unavoidable adoption of this advice tended to establish hereditary disease in after years, whether it arose from chemical, structural, or fungoid conditions.

If a healthy potato is so dug out on its opposite ends that it will resemble a double egg-cup, and placed erect on one end for about six days in an atmosphere at the temperature of 70° F., its under cavity will become covered with mildew, and its fruit will appear in the form of blue mold, *Penicillium glaucum*. In this case the inverted cavity will retain the moisture, and as a consequence slight fermentation will ensue, the fungus deriving its nutriment from the potato; but the upper surface, although fully exposed to the floating germs in the atmosphere, will not sustain a fungus growth, in consequence of the free evaporation of the moisture from it. This form of fermentation should not be confounded with that produced by the fungus of potato-rot, *Peronospora infestans*. The chemical action of the blue-mold fungus is slow, and its odor is simply that of sour paste, while the destructive action of the potato-rot is very rapid, producing a higher state of decomposition and very offensive odors. The mycelium and fruit of each fungus also differ essentially from each other. Both forms of fungus produce oxidation of the cellulose structure, but with very different results. Consequently potato-rot consists of more than the mere "decay of the tissue by its absorption of oxygen." The purely fungoid theory, on the other hand, will not account for the many exceptions pointed out by those who favor the chemical theory; since it may be shown that as the chemical constitution and density of any vegetable vary, so will the genus and species of fungi be found to vary with the proximate principles of the plants on which they subsist.

The following case of rust on the Kittatinny blackberry illustrates forcibly the fact that the structural and chemical condition of a living plant should always be considered in relation to any fungus growth on it.

Chalkley Gillingham, of Accotink, Fairfax County, Virginia, under date of Second month* 28, 1873, describing the condition of his blackberry-canes during the spring of 1872, says that six years ago he planted ten rows of Kittatinny and ten of Wilson in the following manner: First, four rows of Kittatinny, then following, alternately, Wilson and Kittatinny, six rows of each, ending with four rows of Wilson. All had been treated alike from the time they had been received by him, and all appeared healthy until last spring, when the Kittatinny became covered with "rust." At a short distance the rows of the Kittatinny appeared as if painted with yellow ochre. Some were destroyed from its effects. None of the Kittatinny canes bore fruit. The Wilson were uninjured, although surrounded by an atmosphere laden with fungus spores. Every leaf of the Kittatinny was covered with thousands of spores, yet not a leaf of the Wilson was affected. The Wilson canes bore the usual complement of fruit. Mr. Gillingham states that the canes have not been manured for several years.

* February.

Th glossy covering of fruits and leaves consists of wax, that of the gras s of siliceous matter. The wax may be removed by sulphuric ether, the siliceous matter by caustic alkalies or hydrofluoric acid. Should plants fail to eliminate and cover their surfaces with wax or silica for their protection, their albuminous substances will then afford food for the growth of fungi. Future investigations may prove that in the case of the Kittatinny blackberry, alluded to, the absence of this outer protection was the cause of their destruction. The preceding illustration is very similar to that given in my former report on the potato-disease, (see Report for November and December, 1872, page 510,) in which it is shown that two varieties of the potato, viz., Jackson White and Early Rose, growing in the same field, and treated alike in all respects, were affected differently. The Early Rose potatoes were wholly destroyed by fungi, while the Jackson White, although surrounded by the spores of the potato-rot fungus, were not affected.

Having received a supply of seemingly healthy potatoes from New Mexico, Ohio, and other places, and a few diseased tubers from Boston and Swampscott, Massachusetts, I commenced a series of preliminary experiments to test the chemical and structural theories of Dr. Lyon Playfair, and the fungoid theories of M. J. Berkeley and other leading mycologists.

In each of four glass jars I placed a pint of water. In No. 1 were placed a portion of fungus *Peronospora infestans*, and the half of an Ohio potato remarkable for its healthy appearance. In No. 2 were placed a diseased potato containing *Peronospora infestans*, and the half of a potato received from Santa Fé, New Mexico. In No. 3 was placed the second half of the Ohio potato alluded to, and in No. 4 the second half of the Santa Fé specimen. In Nos. 3 and 4 was also put half an ounce of pure sugar, to assist fermentation. These specimens were subject during the experiments to a temperature of about 75° F. The respective jars were examined from day to day. On the sixth day the Ohio specimen in No 1 was found to be rotting rapidly, while the Santa Fé specimen in No 2 was apparently uninjured. Specimens Nos. 3 and 4 were undergoing slow fermentation. At first the water containing the New Mexico specimen became more milky in color than did that of the Ohio specimen, but the deterioration on the third day was greater in No. 3 than it was in No. 4.

On the twentieth day the Ohio specimen was perfectly dissolved, forming a pulp, while the Santa Fé specimen retained its perfect consistency throughout. On examining the pulp of No. 4 under the microscope I found that the starch-granules were arranged in cellulose cells, no liberated granules appearing on the field of view. Bundles of mycelium and budding spores appeared in profusion between the cells. Few infusorials appeared in view. The odor was slightly sour. The appearance of No. 4, as seen under the microscope, of about 80 diameters, was remarkable as contrasted with No. 3. The latter specimens presented a mass of infusorial life, mycelium, and budding spores. I made many examinations of the pulp to detect starch-cells if present, but found none. The fermentation had completely destroyed them, although the starch seemed unaltered. The odor was very bad.

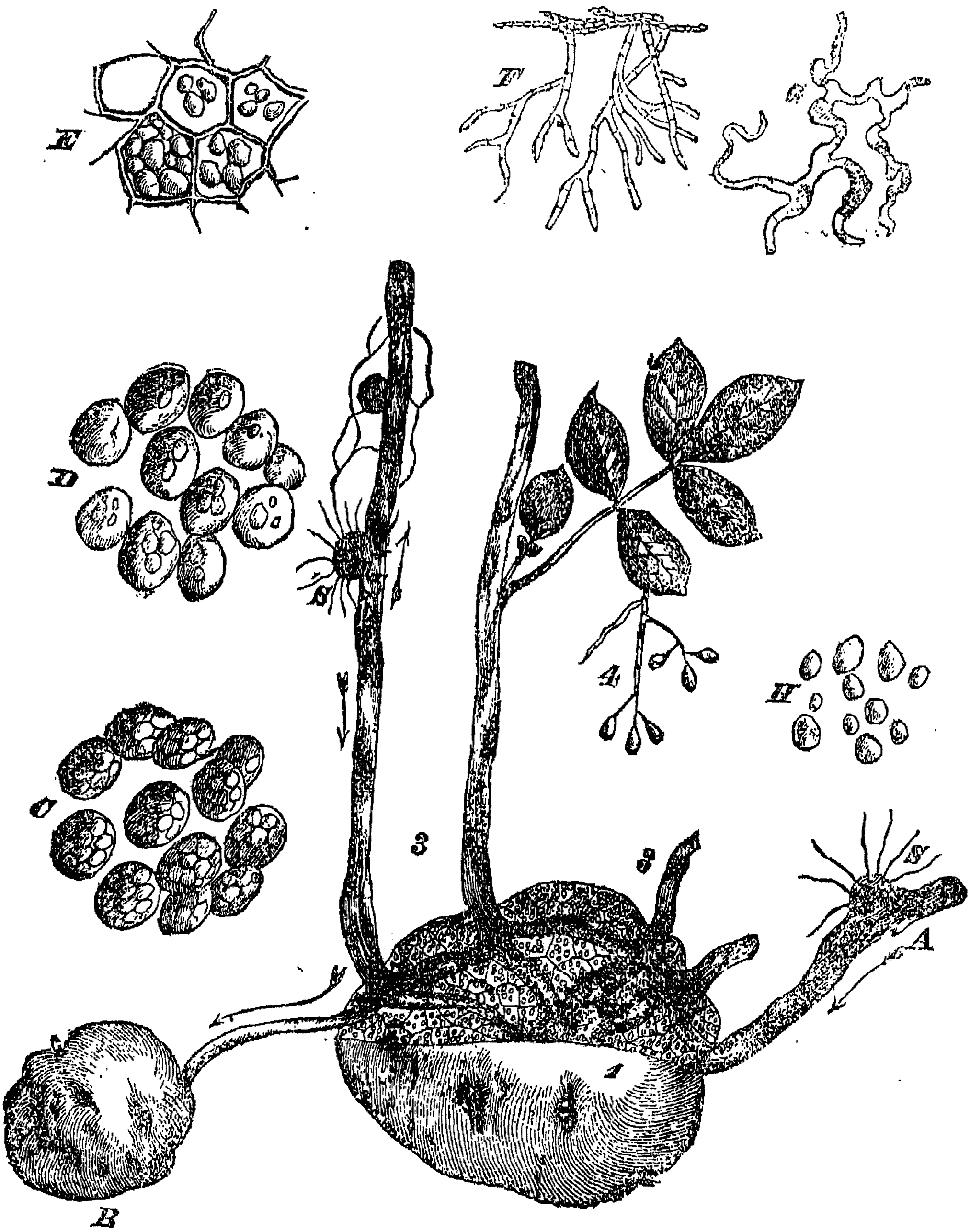
The Ohio specimen in No. 1 rotted much quicker under the influence of *Peronospora infestans* than it did under the *Torula* fungus favored by the action of sugar in No. 4 solution.

The Santa Fé specimen in No. 2 resisted the *Peronospora infestans* fungus better than it did the *Torula* fungus in No. 4; but, by the use of either fungus, the tendency of any variety of the potato to resist fungus

action may, by this mode, be easily decided. Since the preceding experiments were made, other northern and eastern varieties have been tested by fungoid solutions in contrast with some of the New Mexico varieties, giving like results, clearly demonstrating the superiority of the Santa Fé potatoes over all others thus far examined, in respect to their powers of resisting fungoid and infusorial action.

It is not unusual to find a decayed spot in the center of potatoes otherwise apparently in good condition. A microscopic examination of a portion of the diseased part will show that the decay commenced where the vascular bundles concentrate. (See 2, Fig. 12.) At that point the air

Fig. 12.



is in greater volume than elsewhere. Although these mineral acids and caustic alkalies dissolve starch-granules, they do not affect the cellulose cells which contain the starch.

When such spots are exposed to the atmosphere the fungus blue-mold forms on the surface. This disease, therefore, has no relation to potato-rot, as ordinarily understood. F represents the mycelium (roots) of blue-mold, *Penicillium glaucum*, and G that of potato-rot, *Peronospora infestans*.

The vascular bundles are much smaller in some varieties of the potato than in others, and the texture of the cellular matter varies also. I think it probable that those varieties having the smallest air-passages, all other considerations being equal, will be the least affected by the fungus *Peronospora infestans* or *Penicillium glaucum*. The position of the vascular bundles may be easily seen by the naked eye, and a close examination will show that these air ducts extend in every case to the eyes, the stalks being simply an extension of them. Cut a potato in two through its root-stem; trim the surface so that some of its eyes will be in section; coat the surface with a solution of bichromate of potash; dry the surface with filtering-paper, then coat it all over several times with a strong alcoholic solution of iodine; and the starch will become stained of a dark-blue, while the vascular bundles will remain yellow.

The following mode of separating the vascular bundles from the potatoes, so that they may be viewed separately, will prove of interest to the vegetable physiologist: Take a potato of medium size, remove the skin carefully without cutting the eyes; place it in a solution of sugar and water, (in the proportion of about two ounces of sugar to a pint of water,) and subject it to 75° F. for about twelve days. The fungus of fermentation will reduce the potato to a pulp, but the vascular bundles will be found apart and may be removed with a glass rod, and mounted in the usual way with gum or balsam. Under a power of about 100 diameters they present a most singular, yet beautiful appearance. The pointed forms which extend to the eyes may be distinctly seen. This experiment is most successfully performed with highly-cultivated potatoes, such as the eastern and western varieties. The starch-cells of the Santa Fé potatoes, for example, remain in a compact form, even when the nitrogenous matter has been fermenting for many days. The "vascular bundles," therefore, cannot be removed from them easily, which I consider another proof of their matured condition.

The following chemical direct mode of making observations of the position and structure of the air-passages I sometimes employ: First, remove from a healthy potato a thin slice or disk. Pour over it concentrated nitric, muriatic, or dilute sulphuric acid, (caustic potash or soda will have the same effect,) when the starch will become transparent. These alkalies and acids have the effect of dissolving the starch, but they have no effect on the air-passages or vascular bundles; they are, therefore, rendered visible, when mounted in the usual manner, and viewed by a sufficiently high power. 2 and 3, 3, Fig. 12, represent the combination of the spiral and dotted ducts; A, the root-stem; B, a new growth or tuber from 1. Viewing their connection in this way, it will be seen that any germinal disease entering through the root-stem A will necessarily communicate through all the connecting links, viz: A, 2, 3, 3, B. S, S represent the fruit of a slender light-colored mycelium, which I have found traversing the exterior and interior of the withered potato-stalks. In the more advanced stages the fruit has appendages in length about one and a half times their diameter. They have a thorn-like appearance, slightly wavy, and of amber color. To the naked eye they appear like fly-spots, and are very numerous. They appear black, but when treated by nitric acid the dark color is removed and a cellular structure of an amber color is exhibited. Thus far I have not been

able to detect any sporangia in them. This may be accounted for from the fact that all the specimens I have examined had been dried up for a long period. 4 represents the fruit of *Peronospora infestans* on the leaves very highly magnified. The arrows represent the movements of the fungus matter; C, starch-cells, liberated by the fungoid solution and full of starch granules; D, the starch-cells of watery potatoes. They contain very little starch. E, the starch-cells as arranged in the potato. Some are void of starch, while some are well filled; others partially so. H represents the condition of starch in water when a fresh potato is grated down, or when the cellulose cells are rotted away by fermentation, as in the case stated.

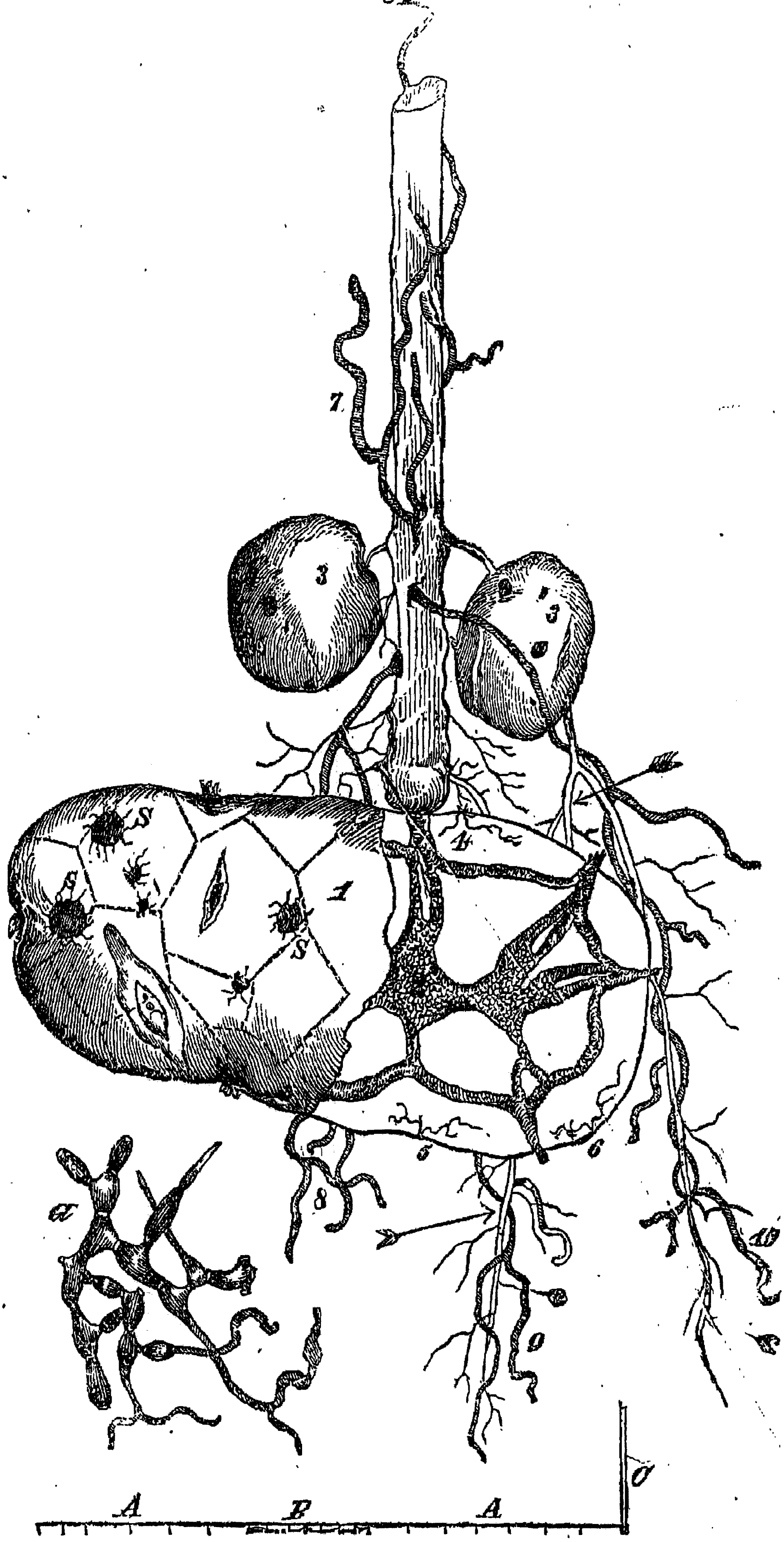
We planted in a hot-house, on January last, a seemingly healthy Early Rose potato, and also one of the same variety affected with the fungus, *Peronospora infestans*. While growing, both were treated as nearly alike as possible, were supplied with a superabundance of water to induce fungus growth, and were subjected to about 70° F. of temperature. Both varieties sprouted and sent forth the usual supply of rootlets, stalks, leaves, and tubers. The original tubers used as seed in these experiments, with their appendages, were examined by me, the object being to ascertain the relative value of diseased potatoes as compared with healthy ones when used for seed. The so-called healthy seed-potato, with its appendages as received, was separately examined for fungoid forms, and especially for that of *Peronospora infestans*, but neither its spores, mycelium, nor fruit were found on them.

My attention was next directed to the unhealthy "seed-potato," its stalks, leaves, rootlets, and tubers. On the surface of the tubers were plainly visible to the naked eye small brown spots, represented by S, S, S, 1, (Fig. 13,) some of which I carefully removed with a penknife. These I placed in strong nitric acid for several minutes. Other portions were submitted to the action of boiling caustic potash. As the mineral acids and alkalies render starch soluble and transparent, or rather transform it into new substances which are transparent and soluble, fungoid forms, if present, are more easily discovered by the use of these solvents. Potash has also the power of rendering the albuminates of the skin soluble, and by its use the fungoid masses S, S, S are more easily separated from the cellular matter of the potato. The fungoid cells are also rendered more transparent. When the brown spots S, S, S are viewed under a power of about 275 diameters, amber-colored budding cells, represented by *a*, are observed, from which protrudes amber-colored branched and jointed mycelium, as represented by 4, 5, and 6. Before examining the rootlets (see arrows) I submitted them to boiling caustic potash a few minutes, to render them soft and easily compressed, and brought into focus. 7, 8, 9, and 10 represent their mycelium and rootlets. Their relative size is represented by the scale A C. A, A represent the parenchyma cells of the rootlets, B their vascular bundles, and C the mycelium on the rootlets. The cells *a* have the same relative size. 2 represents the vascular bundles of the tubers. The dark spots on the young tubers, 3, 3, are composed of clusters of budding spores, as represented by *a*, being of the same form and color as those of the parent tuber. The dotted lines on 1 represent the cellular structure of the skin of the tuber highly magnified.

The stalks and leaves of the unhealthy Early Rose potato, although presenting to the naked eye a healthy appearance, were found to be interspersed with amber-colored mycelium peculiar to potato-rot. The only appearance observable to the naked eye was brown spots on the new tubers, the skins of which otherwise were smooth and transparent.

Their fungoid markings, to an inexperienced eye, would not readily attract attention, as they appear like small portions of brown earth.

Fig. 13.



On comparing the freshly-cut surfaces of the healthy and unhealthy tubers mentioned, the latter presented a mottled and translucent appearance, while a section of the healthy presented a more uniform color. It is clearly shown in this case that as we sow so shall we reap.

On the 12th of April last, a healthy Early Rose potato and a New Mexico variety were planted in one of the hot-beds of the Department. Over both was placed a glass shade, the object being to produce, by artificial means, disease in their foliage. The temperature of their atmosphere ranged about 68° F. The sand in which the tubers were placed was bountifully supplied with water. In consequence of these conditions, a very moist atmosphere was kept up in the glass shade. In a few days the tubers sprouted—the Early Rose first. The foliage of both varieties gradually expanded, but it soon became evident that the leaves of the Early Rose, especially the larger ones, had become affected with what appeared to be "curl of the leaf." Upon examination it seemed that their upper surfaces expanded more rapidly than their under. The leaves of the New Mexico variety became affected similarly, but in a less degree. I examined the leaves under a power of about 90 diameters, but failed to discover any fungoid form. I next ground various portions of the respective leaves into a pulp, placing portions, thinly spread out, under a power of about 300 diameters, but failed to find fungoid cells of any kind developed or in progress. Many portions, however, of the vascular bundles seemed filled with water instead of air, a condition which is not usually found, even when leaves have been left in water for some time. The under surface of the leaves exhibited brown markings; and, when examined with a power of about 90 diameters, the color was seen to be confined to the outward boundary lines of the parenchyma cells of the leaf, showing that the cellular tissue was undergoing oxidation. Within a few hours the central parts dropped out, and the foliage became riddled with holes in consequence of the oxidation.

Oxidation is not always accompanied by fungus growth. If a sufficient quantity of caustic lime is added to decomposing vegetable matmatter it will destroy all the germs of fungi and animal life contained in it, yet the oxidation of the vegetable matter will proceed; but when fungus cells are undergoing the process of budding, oxidation of the cellular tissue seems to be necessarily a secondary condition. The "curl of the leaf" may not always be the result of a fungus growth, but the conditions which produce it will necessarily retard the growth of the plant commensurate to their extent, and pave the way for *Torula* fungoid growths. I next put the plants into separate flower-pots, and exposed them to the influences of the open air. In a few days the foliage of both kinds attained a healthy color, but was stunted in growth. After three weeks' exposure, under favorable conditions as to heat and moisture, the foliage of both appeared healthy.

On June 9 the New Mexico plant put forth flower-buds, while the other, although known to be an early variety, did not exhibit any. While both plants were passing from their unhealthy condition in the open air, many of the leaves of the Early Rose plant withered and died; the leaves of the other remained a healthy green throughout, showing a superior vigor.

On the 19th of May last three varieties of New Mexico potatoes were planted in the Department grounds for experimental purposes, and notwithstanding the extreme dryness of the atmosphere during the last thirty days their growth has proved highly vigorous. The stalks are numerous and from 10 to 12 inches in height. The foliage is abundant,

has a very healthy appearance, is highly wrinkled, of a dark green color, and is remarkably free from insect injuries. At this date (June 13) their buds are forming.

Judging from present appearances, any of the three varieties would prove highly valuable for localities subject to a hot and dry atmosphere.

The New Mexico potatoes, although not so mealy as the New York Peach-blows, white and red, are dry and of good flavor. Their cultivation in the Northern States will doubtless modify their structural and chemical properties and improve them. At present they seem wholly free from the fungus of potato-rot. In order to test their anti-fungoid properties more fully, samples have been forwarded to experienced farmers in the State of Massachusetts, and other States, to be planted with other varieties known to be very liable to potato-disease. Any practical results derived from experiments now in progress will be given in a future article.

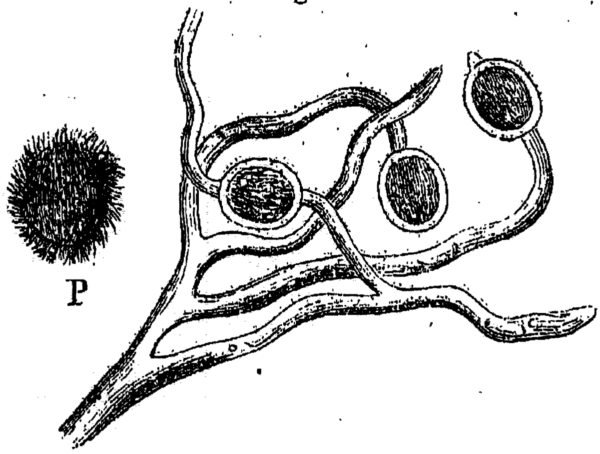
The Department has procured samples of every variety of the potato from Santa Fé, New Mexico, to test practically, in the open field, their anti-fungoid qualities, in contrast with the usual varieties grown in this country.

In a letter addressed to this Department by Governor Arny, Santa Fé, New Mexico, February 17, 1873, he says: "We have not had any 'rot' in the potatoes of New Mexico. * * * I send two packages of alkali soil; this is a soil on which potatoes will not grow—abundance of tops, but no 'tubers.'"

An excessively alkaline soil seems to have the same effect as very high manuring, viz: to produce stalks but no tubers.

In Hardwicke's Science Gossip for October 1, 1872, page 225, is illustrated a fungus, which was first discovered by Dr. Payen, growing among the mycelium in the intercellular passages of spent potatoes affected with rot. Fig. 14 presents the illustration given in that journal.

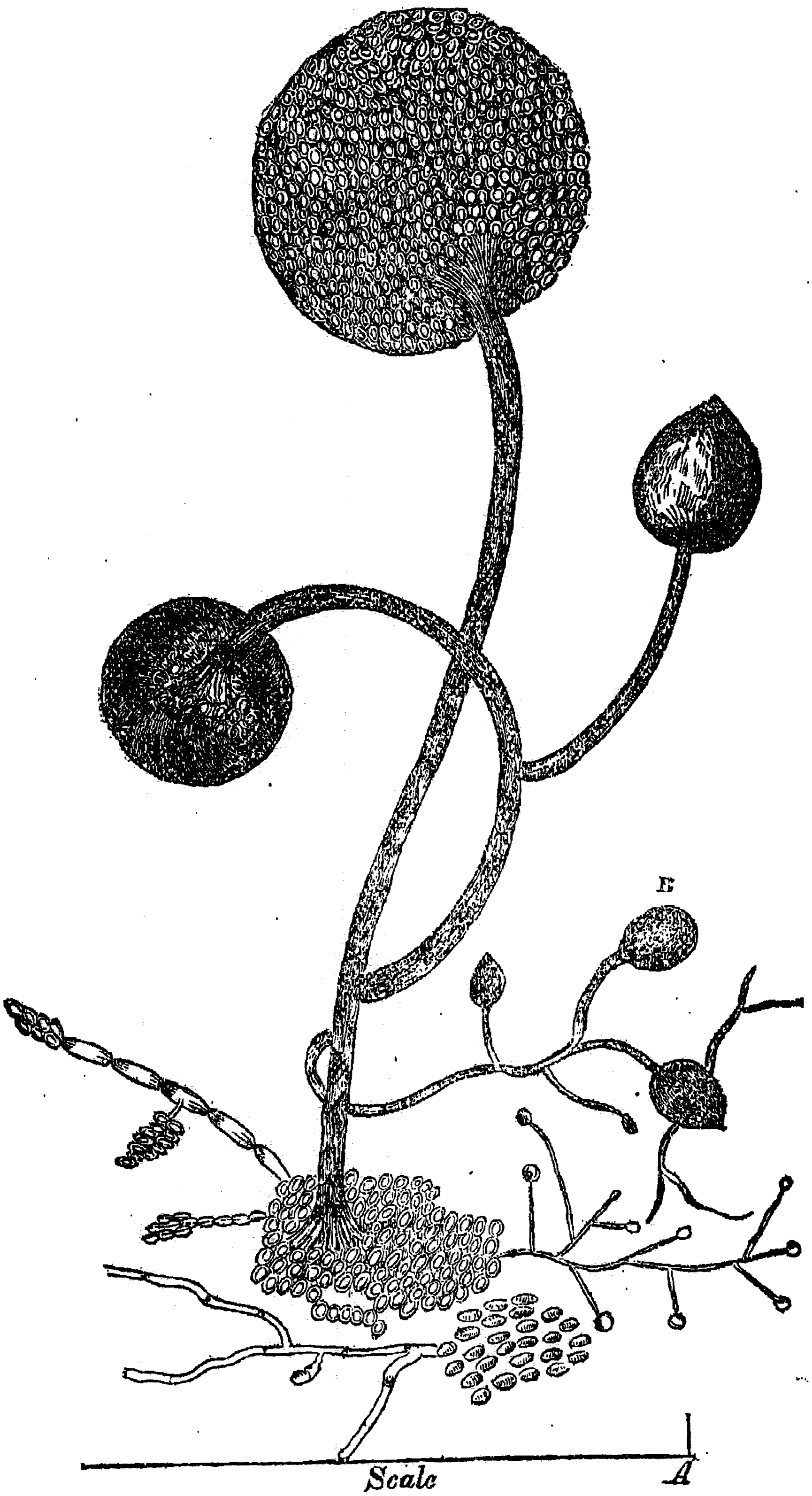
Fig. 14.



This fungus has been named by Montagne *Artotrogus hydnosporus*, although considered by Berkeley and others to be probably a secondary form of fruit (oöspores) of the potato-fungus itself. In order to test the matter more fully I placed a portion of a rotting potato affected with *Peronospora infestans* in a clear glass jar, and allowed it to ferment. After the lapse of two months a mold, or mildew, formed on its surface. Placing a small portion of this on a glass slide six inches long by two inches wide, I inclosed the latter in a jar containing about an ounce of distilled water, and secured its contents with a ground-glass stopper. I examined it in its different stages of growth, every twenty-four hours, for several weeks. I have repeated these experiments many

times during the last six months, always getting the same general result. Fig. 15 illustrates the various stages of its growth. The diameter of

Fig. 15.



the fruit B represents the thousandth of an inch, and the scale **A,** one hundredth of an inch. The color of the fruit resembles that of matted silver, rich and somber. The principal fruit-stalk, although represented

as branched, is not always so in nature. The stalk is frequently found supporting but one head or fruit. The stalks, when fully ripe, are cellular and of a peculiar structure.

In order to ascertain whether a rotting potato, which had decayed from ordinary *Torula* fungus fermentation, *Penicillium glaucum*, would produce, under similar treatment, a fungus like Fig. 14, or one of a similar type, I instituted a second set of experiments, using a mush made directly from healthy potatoes. The experiments were conducted in the same manner as those already described, extending over a period of six months. The result was that the pulp of the healthy potato invariably produced *Penicillium glaucum*, while that of potatoes infested with *Peronospora infestans*, with a like uniformity, produced the fungus represented by Fig. 15.

It would seem from experiments that the fungus *Artotrogus hydnosporus* is in some way peculiarly connected with *Peronospora infestans*, or "potato-rot;" and during its highest stages of fermentation it would also seem to have the power of destroying the germ of the fungus *Penicillium glaucum*.

One of my early experiments with rotting potatoes consisted in placing some of those affected with the fungus *Peronospora infestans* in a saturated solution of sulphate of copper. After a lapse of four weeks I removed the affected potatoes from the copper solution and placed them in pure water, changing the latter every twenty-four hours, as long as the liquid at the end of that time had the bluish tinge indicating the presence of copper in solution. I next placed the potatoes in separate glass jars. After the lapse of several weeks the water became slightly blue in color, still showing the presence of sulphate of copper. To my suprise the mycelium of a fungus had grown in profusion on the potato, its branches extending upward to the surface of the liquid. In the course of the next two months little white specks appeared on the surface. These specks ultimately developed into distinct circular forms, resembling a lady's low-crowned hat, having a thickness of about one-eighth of an inch at the center of the crown, with a diameter of about half an inch, and a pure snow-white color. All these disks finally united, covering the surface of the liquid with a felt-like substance, which apparently derived its sustenance from the potato, through the mycelium above referred to. On examining portions of this substance under a power of three hundred diameters, I found it to consist of white *Penicillium* thickly matted together and in full fruitage.

Sulphate of copper in solution has been frequently recommended as a reliable antidote to fungoid growth. In the present experiments it evidently destroyed the *Peronospora infestans*, but did not destroy the *Penicillium*, the germs of which must have existed in the potato, as well as those of the former fungus; though it has already been seen that where *Peronospora infestans* produced putrefaction the *Penicillium* never made its appearance, its germs having probably been destroyed by the more powerful fungus. It may be remarked, in conclusion, that the failure of the solution of sulphate of copper to destroy *Penicillium* renders it probable that it would prove ineffective as an antidote to other forms of the fungi belonging to the family *Mucedines*.

BLACK-KNOT.

Entomologists and botanists are now pretty generally agreed that the black-knot of cherry and plum-trees is produced by a fungus, but they have failed thus far to define sufficiently its internal and external struct-

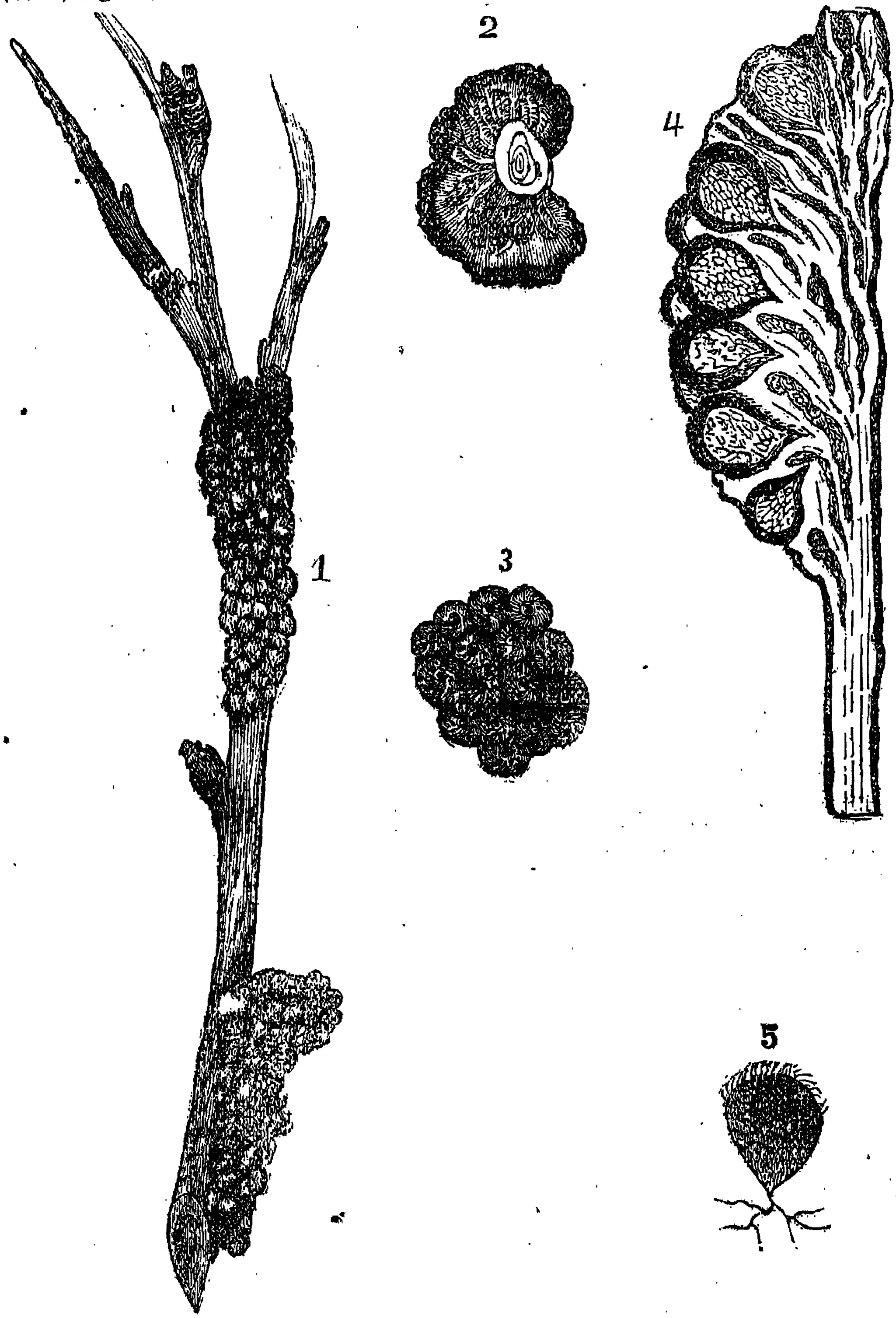
ure. Schweinitz, the American botanist, who died in 1834, seems to have been the first who suggested that it might be of fungoid origin, and he named it *Sphæria morbosa*. During the present year several correspondents engaged in fruit-growing have sent to the Department specimens of cherry and plum tree black-knot, asking for information in relation to its cause and cure.

Hon. Marshall P. Wilder, of Boston, forwarded some specimens of the black-knot on plum-tree branches, which I used as the basis of my experiments. The ordinary methods of investigating the black-knot by placing opaque sections of it under the miscroscope gave results so unsatisfactory, that I determined to employ my usual methods of rendering organic bodies transparent and soft, by means of acids and alkalies. In this way the higher powers of the microscope may be brought to bear effectively on the fungus, its mycelium, flocci, and spores, if present. The immediate use of strong mineral acids and caustic alkalies on suspected fungoid bodies has this advantage, that these prevent the possibility of the production of fungus growths by fermentation during the investigation. Portions of the black-knot were subjected to strong nitric acid during several days, and then examined under low and high powers of the microscope. Portions were also well washed in pure water to free them from acid, and then submitted to the action of caustic potash. For the purpose of distinguishing colorless spores, mycelium, starch, and cellulose from one another, a solution of iodine, containing a small portion of nitric acid, was applied to the specimens. This solution colors starch blue, fungoid transparent matter a light amber, infusorial forms a dark amber, while cellulose generally remains colorless. When viewed under a power of 100 to 600 diameters these substances are clearly distinguished from one another. I also submitted the dry leaves of the twigs to the same processes and examined their translucent cellular forms carefully, and observed some indications of fungoid forms within the cells of the leaves.

1, Fig. 16, represents the general appearance of the black-knot of the plum; 2, a cross-section; 3, an enlarged view of it, showing indentations on the external surface of the conceptacles or *perithecia* of the fungus; 4, a longitudinal section of the black-knot and branch of a plum-tree, in which sections of the *perithecia* are exhibited highly magnified, while the woody fiber is represented of the natural size, as seen by the naked eye; in its advanced stages its woody structure appears as if it had been broken up into shreds and its interstices partly filled with a very porous bark-like substance, which is again interspersed with a very fine transparent thread-like mycelium; I have no positive evidence, however, that this mycelium has any direct relation to the black-knot fungus; 5, a typical representation of the *perithecia;* Fig. 17 represents a very highly magnified transparent view of a *perithecium* in section and partly covered with flocci. The structure is cellular as exhibited, and of a dark amber color. Each top surface-cell of the *perithecium* generally contains two or more very minute spore-like bodies; frequently the bottom cell of the flocci contains these spores also. The flocci are jointed and branched, and resemble very much in structure black-orange mycelium. I have found floating in the gum solution, when examining the respective parts of black-knot, several small forms resembling *Cladosporium* having very short stalks and of the same color as the *perithecium* and its flocci. This led me to renew my experiments. I placed on slips of glass portions of *perithecia* and their flocci, and exposed them within jars containing about an ounce of water, securing the contents with ground-glass stoppers. I then subjected them to a temperature of about 75° F. for a period of fifteen

days. After many trials of this character I obtained several examples of *Cladosporium* growing on the flocci as suspected by Professor C. H. Peck. (See 6, Fig. 17.)

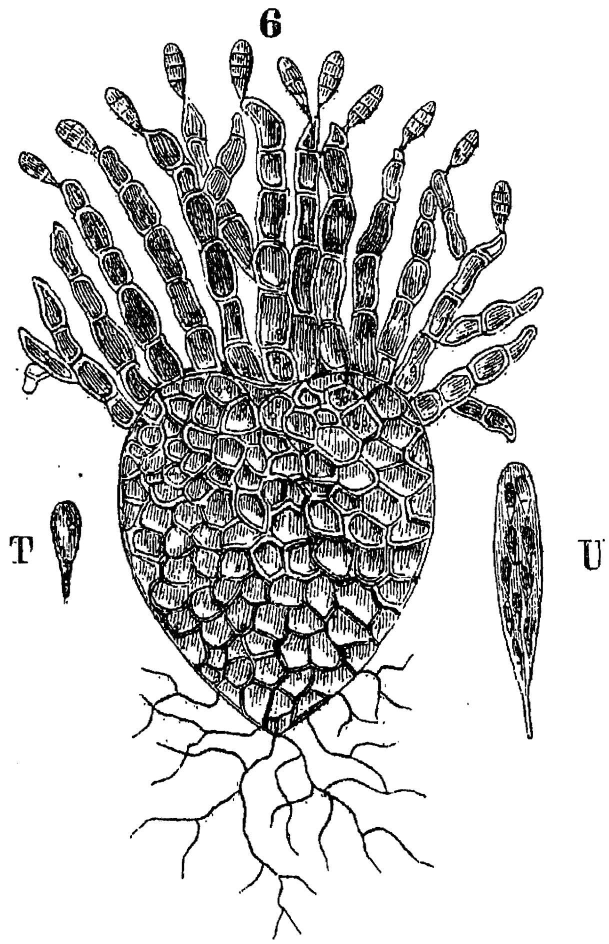
Fig. 16.



I endeavored to secure the specimens under glass with gum solution in the usual way, but the moment the fungus was wetted with the gum-water the *Cladosporium* separated from the flocci. I have since frequently endeavored to restore all the conditions necessary to produce the visible combination of the flocci with *Cladosporium*, but have thus far failed, although it is common to find the *Cladosporium* or club-shaped *perithecium*

floating on the glass slides. When a branch such as that represented by 1, Fig. 16, is bleached by the alternate action of nitric acid and chlorin-

Fig. 17.



ated soda, the parts covered with the fungus are freed from it, as I find it mostly on the surface of the excrescences. A microscopical examination of the mass will show that it is almost wholly composed of woody tissue, vascular bundles, &c., and is so void of earthy matters that it resembles a sponge more than a piece of wood. That portion of the branch which appears unaffected by the fungus remains as firm as if it had not been treated with chemicals. It would seem that this fungus produces an irritation on the surface of the branches, from which masses of perfectly formed cellular structure then burst out, preventing the growth of consolidated wood. It is generally supposed that when black-knot encircles a branch it dies from compression, whereas black-knot consists of expanded spongy fiber composed of pure cellulose and covered with the fungus. The mass of the substance supposed to be black-knot is really pure organized cellulose, and is therefore closely approximated to starch and sugar. This may account for its having been so frequently made the abode of insect life, and has led to the belief that it was produced by insects.

In answer to a communication of mine, Professor C. H. Peck, botanist, of Albany, New York, informs me that he has found sacks filled with spores within the *perithecia* of black-knot, and has furnished me with a sketch of the sack as seen by him, (see U, Fig. 17.) T represents a highly magnified view of the true spore of this form of *Sphæria*. After

several fruitless dissections, in search of their true spores, I found them ultimately floating among the crushed cells on the glass slide. They are almost colorless, with a slight tinge of green, and are smaller than the spore of the flocci, are double-celled, and uniform in shape. Although I have not seen these spores in sacks, I think it likely that the drawing U is correct, and I can testify to the accuracy of that of the spore T.

In the growth of black-knot the *perithecia* crowd each other so much, that their original shape is changed in a variety of ways, but in the main I have frequently found well-defined forms. Fig. 17 probably represents its typical shape in section.

Dr. A. L. Gilbert, North Cohocton, Steuben County, New York, sends the following communication to the Commissioner of Agriculture, relating to his treatment of trees affected with black-knot:

SIR: About twenty years ago a seedling plum-tree in my garden became infested with the "black-knot." I cut off all the affected branches and sprouts or suckers, cultivated the ground, and continued this treatment, cutting away on sight all diseased portions, and for ten or more years had good crops of plums and a healthful growth of wood, while, in neighboring gardens, neglected trees of the same and of other sorts either died or became stunted and unfruitful.

I subsequently purchased a place having on it both plum and cherry trees affected in the same way. I treated these in a similar manner, and have had annually a good growth of wood and fair crops of good fruit, except in some instances when it was injured by frost or the curculio. On a neglected lot near by, the same kinds of trees have become so infested, unsightly, and worthless, that they are fit only for the fire.

A neighbor of mine having about twenty English-red cherry-trees, unfruitful and apparently worthless, which he was about to cut down, concluded, at my suggestion, to try heroic surgery. Limbs and sprouts were cut away, piled, and burned; large wounds were treated with a coat of dissolved shellac, and the ground plowed. The next year the trees presented a fine appearance, and yielded cherries enough to pay for all the labor bestowed upon them, with good promise for the future.

ORANGE BLIGHT.

During the last two years the Department has received numerous letters from orange-growers in Florida calling its attention to a new form of disease that has appeared on their orange-trees. The branches become covered, more or less, with a rust-like substance which ultimately destroys the affected parts.

Mr. J. H. Gates, of Pilatka, Florida, under date of November 27, 1872, writes to the Commissioner of Agriculture as follows:

Inclosed are a few orange-leaves, and also an orange having a dark skin. This dark color of the skin appeared on nearly half of the oranges of some of our growers last season. They are not so much discolored this season. The coloring matter, whatever it may be, does not injure the quality of the fruit, but it affects its market-value. Also, please find inclosed three branches of an orange-tree having a rusty appearance, and in some places blistered. I have trees which have lost all their tops, apparently from this cause. Any information relative to the cause or cure of this disease will be gladly received by myself and neighbors.

In a second communication from the same writer, dated December 31, 1872, further information is given in relation to the so-called rust of orange-trees. He says:

It first appeared in this section (Saint John's River, near Pilatka) about three years ago. The young buds were first attacked. The disease next spread to the young wood, and then gradually over the tree. We observe that the disease is more general on the low-lands, and it generally appears on transplanted stumps having buds from one to three years of age. I have not known any bearing-trees to have rust on their bark. Some persons in this vicinity think that the rust is caused by a worm; others by cocci; while others suppose that the black coloring-matter on the skin of the orange is silica. Any light thrown on this subject by the scientific men of your Department will prove of great value to us.

The following letter received by the Department from Mr. F. L. Darcy will not only prove of interest to orange-cultivators, but also to those who desire to investigate this disease. The writer first refers to insect-disease as being its probable cause, then to the dark stains on oranges, and lastly to the rust, so called, on the branches.

BUENA VISTA, ORANGE MILLS POST-OFFICE, FLA.,
January 5, 1873.

SIR: In reference to the disease of the orange-trees I have to say that I have noticed it for many years, more or less, in every orange-grove that I have visited, but never in such quantity as to be at all alarming. In my own groves I have not for twenty years observed more than three or four trees affected by it. Those were budded trees—sweet buds on the wild or sour orange stock. These trees were inclosed in a small fowl-yard about 20 feet square, boarded up 5 feet high, with a small house inclosed. The trees outside of the inclosure within 20 feet of the former grew well, and having been set out and budded at the same time of the first, were all planted in 1836, and have continued perfectly healthy. After three years' trial I found that the four trees within the inclosure were still unhealthy. Every season they threw out young, vigorous branches which grew till they were 6 to 8 inches long, when they would commence dying back from the extreme ends, and the bark in most instances would become rough and of a yellowish hue, while the trees from year to year remained about the same size. I concluded to remove the fence and house from around them. This was done three years ago. The trees, with one exception, are now as vigorous growers and as healthy as their neighbors, while the fourth is gradually improving. This disease, I think, is produced principally by an insect. The bark of the tree is punctured and the eggs deposited there. In the case of the four trees mentioned I am of opinion that they first became diseased from being too closely confined and not having free circulation of air during the heat of summer; the great stimulating quality of the fowl-house manure may also have had a bad effect on them; for soon after removing the inclosure and manure they commenced gradually to improve, and are now nearly restored.

A very common error of beginners in orange-culture consists in burying the tree too deeply in the ground, covering up from 4 to 8 inches of the collar of the stock, which should be above ground. In this condition the tree may live, but will grow very slowly, making very little new wood for years. When the buried collar has thrown out artificial roots the trees may revive, and in the mean time will continue to throw out vigorous sprouts, but they will die back each season, much to the disappointment of the impatient cultivator. This is termed "damping off." When this is the case it is easily remedied by lifting the tree, or bringing the natural roots to the surface. Drainage is all-important for orange-trees. They will not flourish when the roots remain in stagnant water.

The disease known as the rust has affected the orange-trees since 1864 in this section of the State, the consideration of which is of far more importance than the black substance, &c., on the trees alluded to. The "rust" may be caused by an insect or a fungus.

I will send you some samples of the oranges having dark stains, and also a few having clear skins, taken from the same tree, hoping that some of your scientists may be able to inform me what are the causes of the respective diseases, and, if possible, to suggest to me a remedy.

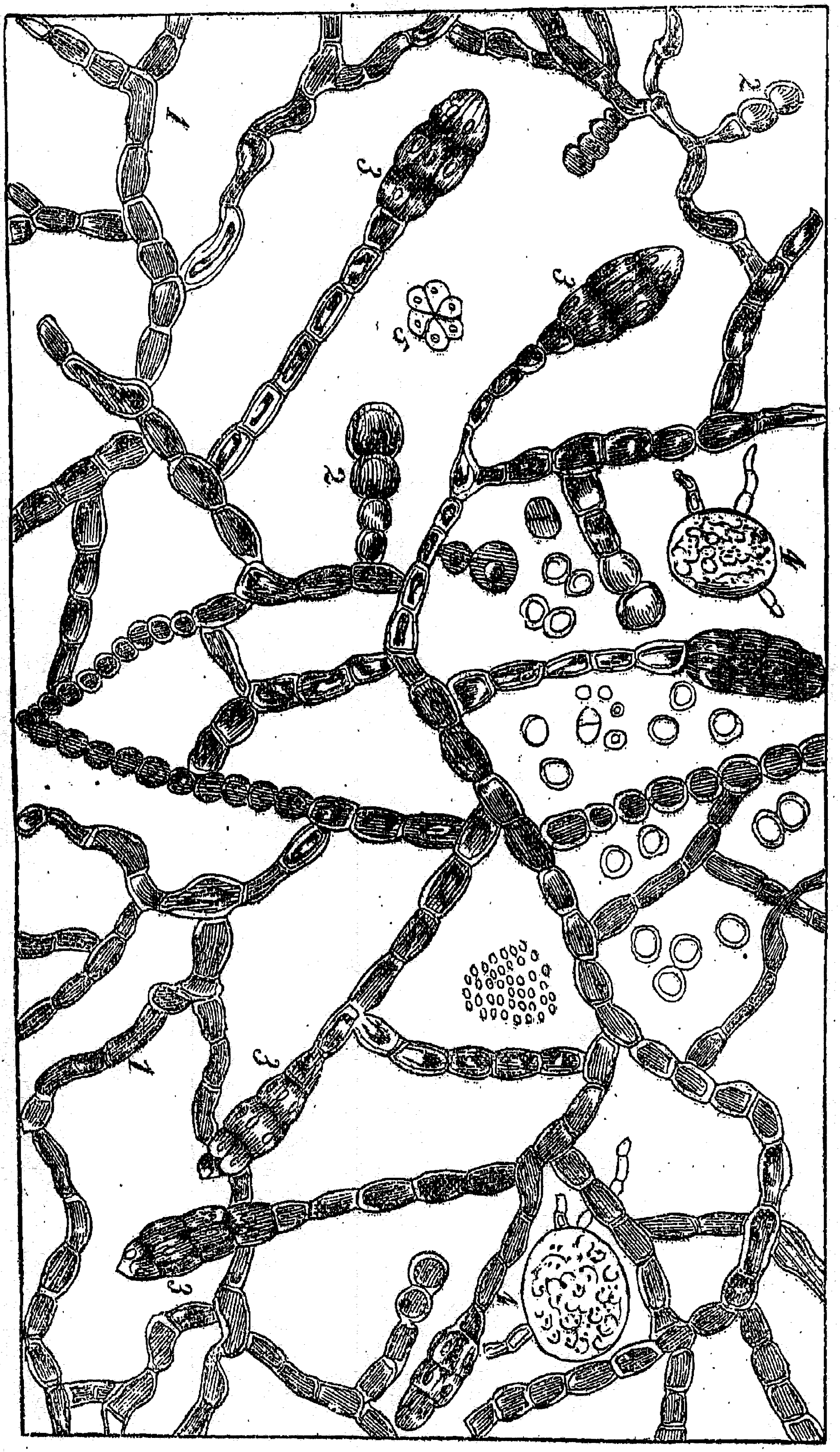
Respectfully, your obedient servant,

F. L. DARCY.

Mr. J. A. Whitner, of Mellonville, Fla., states that "the rust appears either on high or low lands, more frequently on the low or flat lands, which in this locality are imperfectly drained. The trees affected with this disease are always checked in growth, but rarely die. They recover under high cultivation with judicious manuring, but bear small and imperfect fruit, with a tough, spotted rind, and a hard, insipid pulp. I send you, as requested, by this mail, specimens of twigs affected by this fungus, healthy and unhealthy, taken from the same tree; also specimens injured by bark-lice. These insects are very destructive and widely spread in this vicinity. They are the cause of the fungi or leaf-smut generally confined to young trees."

The Department has received several communications from orange-tree cultivators of Texas in relation to orange-blight, but thus far it would

Fig. 18.



seem that the rust-blight is unknown to them, as the following from Mr. Sydney Scudder, mayor of Galveston, Texas, will show:

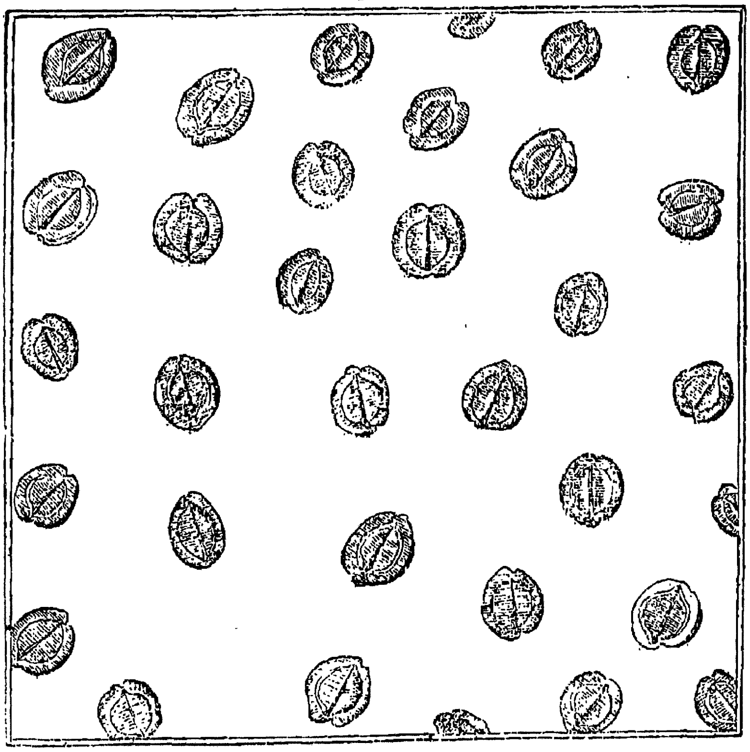
Your communication of November 27, 1872, was duly received. Careful inquiry of orange-tree growers and personal examinations of numbers of trees in this county have developed nothing in the shape of disease among them at this time. The excessive drought of the past summer diminished the crop considerably, and caused the fruit to become unusually sour and unpalatable. This was, however, effectually remedied by loosening the earth under the trees and spreading ashes or pulverized soil or charcoal around them. The Rev. P. C. Tucker was particularly successful with this remedy applied to his orange-trees this fall.

On being supplied with specimens of the so-called "rust," blackened leaves, branches, and fruit, I made a series of observations and experiments to ascertain, if possible, the character of the various phases of the fungus and affected parts of the plant, so as to be able to point out cause and effect. I removed portions of the rust from the branches, subjected them to a power of about 30 diameters, and viewed them by reflected light. No fungoid forms were visible.

I next treated a portion of the rust with caustic potash, in which the so-called rust proved partially soluble. The insoluble portions were washed with pure water until all soluble substances were removed. I then subjected several portions of the insoluble parts to a power of about 100 diameters, when they were seen to consist of cellular, fibrous, and woody matters, and were wholly free from fungoid forms. I next subjected a portion of the "rust" to the action of alcohol of 95 per cent. proof. The alcohol became tinged of a brown color. On pouring a portion of the liquid into water a white precipitate was formed, showing the presence of a resin.

A very close inspection of the "rust" under a power of about 5 diameters exhibited, in some cases, a slight gloss on the surface. At this stage I became convinced that the "rust" was probably only an effect

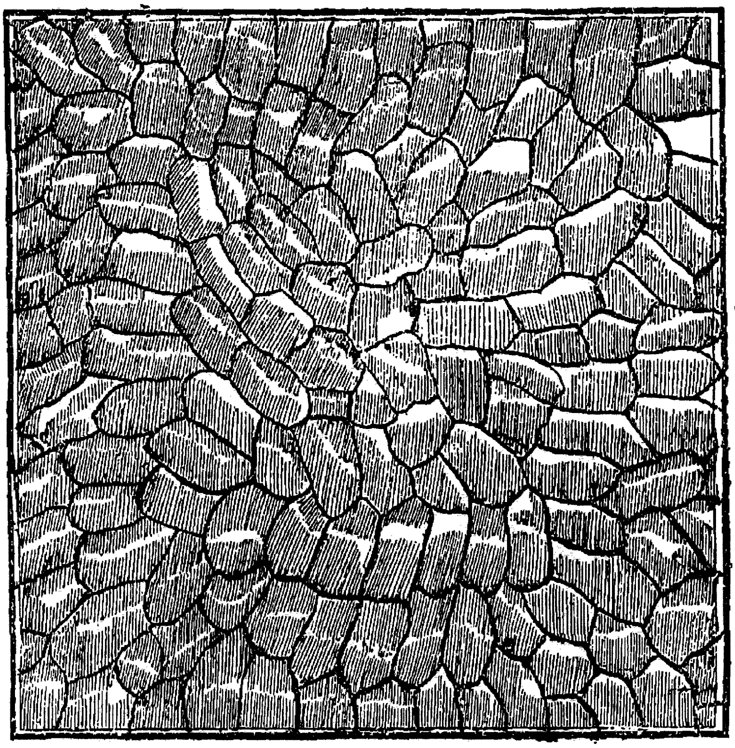
Fig. 19.



of a fungus, and consequently not the cause of the dying back of the branches. On the development of these facts, I suggested that Mr.

Gates should make a thorough search for specimens of "rust" exhibiting a slight translucency. In due time specimens were received from him

Fig. 20.



slightly translucent, portions of which were held over the flame of a spirit-lamp, when instant resinous ignition took place. Its smoke had the odor of burning shellac. The "rust," so called, proved to be composed of albuminous and resinous matter combined with vegetable cellular tissue, earthy matter, &c., unimportant to consider in this case. My attention was next directed to the investigation of the black matter on the leaves, branches, and fruit. I removed a portion of the black matter from a leaf. It appeared as if composed of black, granular matter, cemented with flour-paste, and formed into thin sheets of the thickness of tissue-paper. When dried it may be cut to any form desired. Sometimes it appears as a fine black powder scattered over the leaf, and is frequently found in quantity at the base of orange-buds. On placing a portion of the black matter under a power of about 100 diameters, it is seen to consist of a branched and jointed mycelium or spawn of a fungus. After making many observations, under a power of about 600 diameters, the fungus, in its various stages, was clearly defined. 1, Fig. 18, represents its mycelium growth; 2, 2 its budding cells, which terminate in fruit-cells; 3, 3, 3, 3, bearing spores which germinate; 4, 4 are fungoid aggregations, which throw out filaments; their relation to the black mycelium is not represented thus far; 5 represents what appears to be a cross-section of the asci or fruit, when perfectly formed and cut through its greatest diameter crosswise. The surface of the leaf is generally covered with these germinating spores when the black mycelium is on the leaf; being colorless they are invisible. Frequently Vandyke-colored cells are seen on the leaf. They consist of disjointed mycelium. To the naked eye the fungoid spores, &c., appear black, but under the microscope they appear of a Vandyke-brown, with the exceptions noted. It is known to mycologists as black mycelium, of the genus *Antennaria.*

Berkeley says that "of late years the black mildews have raged to such an extent in the Azores and Ceylon as to threaten the complete annihilation of the orange and coffee plantations, and the ravages have been scarcely less among the olives in some parts of Europe. It is impossible that light can have its proper effect through such a medium on the tissues of the leaves. It would be as rational to expect that plants would thrive under a brown bell-glass as that vegetation should not be impared when the greater part of the plant is covered with a thick, dark felt. The mildews are often accompanied or preceded by a coccus, and I believe that the first stage of growth of most *Antennariæ* is more frequently observed where the leaves have been soiled with honey-dew."*

It has long been observed that a black powdery substance always forms on the leaves, buds, and the fruit of the orange-tree and some other plants when attacked by the "mealy-bug" and orange-scale insects. The plants are doubtless punctured by these pests, causing a flow of sap from the ruptured parts, which probably forms a nidus for the black mycelium to vegetate in, spreading over the whole tree, blackening and destroying it. The skin or epidermis has its peculiar functions to perform, and, if covered, its healthy action will be impeded. All molds and blights are plants of a very low organization, and live in this predaceous way; as do also some flowering herbs, and even shrubs. One of the latter is the mistletoe, the seed of which germinates on the boughs of the tree where it falls, or is left by birds, and forming roots, which penetrate the bark, the plant ingrafts itself into the wood, to which it becomes united as firmly as a natural branch to its parent stem. Indeed, the parasite lives just as if it were a branch of the tree on which it grows and feeds.

Botanists represent that the green bark of plants is furnished with breathing pores as well as the under surface of the leaves, and in some cases the upper surface. In this case I determined to ascertain their relative number on the green bark and leaves of the orange-plant. With this object in view a portion of the bark was removed with a sharp knife, and treated with hot caustic potash, after which the epidermis was easily removed. When mounted and viewed with a power of about 100 diameters the numerous pores were seen and could be counted. A portion of the skin no larger than a fly-spot contained about twelve of these breathing pores. I next experimented with the orange-leaf to ascertain the true character of its upper and under surfaces. A leaf was placed in a strong solution of nitro-muriatic acid, which bleached it slightly and rendered it somewhat transparent by oxidation, without softening the albuminoids which bind the surfaces together. The next step was to wash the leaf in water to free it from excess of acids. With a circular steel punch a portion of the leaf was cut out and placed for a few minutes in a capsule containing a strong solution of chlorinated soda, after which it was placed in pure water when the epidermis of the under surface of the leaf floated off. The object of placing the prepared portion of the leaf in the soda compound was to soften the albuminoids, and bleach more perfectly the chlorophyl. On being immersed in the solution its upper surface assumed a well-defined brown color, while the under remained transparent, thus showing that the upper epidermis differs chemically from that of the under surface. This fact may explain why some forms of fungi are found on the upper surface of leaves, while others are found principally on the under. I next floated the disk thus

* Honey-dew is a sweet, saccharine substance found on the leaves of trees and other plants in small drops like dew. Two substances have been called by this name, one secreted from the plants, and the other deposited by a small insect.

removed on to a microscopic slide, using a camel-hair brush to assist in the manipulation, and mounted it with gum and disk in the usual way. The surface was found to be almost destitute of cellular structure. The stomates are best seen under a power of about 600 diameters. (See Fig. 19.) The green bark and under surface of the leaves contain about 64,000 of these pores to the square inch of surface. The thick disk should be floated on to glass as above, and its superfluous moisture removed with clean blotting-paper. Its exposed surface should be placed face downward. With a point the epidermis may be removed, which place in water and float on to a glass slide as before described. It will represent the upper surface of the leaf. On examination with the microscope it exhibits cellular structure only, and seems to be wholly destitute of stomates. (See Fig. 20.) The fleshy portion on the third slide should have a drop of thick gum placed on it and be covered with a glass disk. When viewed under a high power it becomes an object of much interest. The branching vascular bundles will be distinctly seen, resembling in some respects the arteries and veins of the human body. A careful examination will show that these are also covered with a very fine lace-work of cells under and over them, and interspersed among the latter will be seen a vast assemblage of translucent dottings, each having an opening across it corresponding to those of the stomates under which they were situated before dissection. The structure of the leaf, taken as a whole, indicates the great necessity of cleanliness and high culture; for the more complicated the organic structure of the plant is, the greater will be the number of its economic products, and the more apt are abortions in the form of fruit to be produced in the case of neglected culture or unfavorable climatic conditions. In plants there are "milk-vessels, turpentine, oil-receptacles, and the like, which form canals or cavities between or among the cells and are filled with the particular product of the plant." Not so with the lower forms of fungi. Their roots may grow in profusion, although frequently torn to pieces, because of their simple form of structure and habits. A single cell of mycelium will germinate, bud, or reproduce its kind as perfectly as will a spore of its fruit. In this case the lower forms of fungi have a decided advantage over the higher organized plants. Climatic conditions wholly unfavorable to the growth of the latter are highly favorable to that of the former.

Probably the true remedies for the evils complained of consist in thorough drainage, proper culture of the soil, moderate manuring, and destroying the cocci and fungi by frequent washings with weak alkaline solutions, such as potash, soda, or ammonia.

Orange-plants confined within glass structures suffer a great deal from insects and fungi, and the remedy in use in such cases consists in thorough washing with whale-oil soap and water, and the free use of a soft brush. Frequent washings are necessary.

At page 115 of the annual report of the Department of Agriculture for 1855 is published an interesting description of the habits of the orange-scale insect, by the entomologist of the Department, in which he proposes to syringe the plants affected with a solution of guano. Its ammonia destroys the young cocci as they emerge from the shelter of the parent scale, while the droppings enrich the soil.

Since the foregoing was prepared, many letters have been received by the Department from intelligent orange-tree cultivators in Florida, imploring its assistance in the matter of the *orange-blight*, as the destruction of many of their trees seems imminent if a reliable remedy is not found quickly.

It is to be regretted that the Department has no fund at its disposal for original investigations in the field. Funds should be at the disposal of the Commissioner of Agriculture to enable him to send scientific persons to make thorough examinations when they are deemed necessary. It is not reasonable to expect that correspondents wholly unaccustomed to making scientific observations can be able to collect all the facts necessary to enable an expert to draw correct conclusions from them.

APPLE-SPECK, OR ROT.

J. M. Steel, of Harrisburgh, Arkansas, under date of August 16, 1873, writes to the Commissioner of Agriculture as follows:

> I desire to make inquiry in reference to the apple-speck, or rot. Our apples on Browley's Ridge are all seriously damaged this season by a speck or blister, of the size of a dime or less, which appears on their skin. The speck becomes larger as the season advances, and the apples at length decay on the trees and fall off. This speck has been observed on our apples for some years past, but has never been so destructive to the fruit as during the last season. The fruit begins to rot when it has attained its full size, apparently from a deficiency of the proper food necessary for maturing it. We sometimes think that the rot is occasioned by the sting of a curculio, but as we have no means of searching out the cause, we apply to you, hoping that you will be able to give us a remedy. Apples, pears, plums, grapes, and berries of various kinds do well here until the ripening season approaches; then a blight comes over them, and our flattering prospects are also blighted.
>
> Our winter-apples are so badly damaged from rot that we seldom think of saving any for winter use. Many of our young orchards are just coming into bearing, and the prospect is quite discouraging to our farmers when they consider the prevalence of this destructive disease. Our climate has a damp and humid atmosphere, and is peculiarly adapted to cotton. Any information which will tend to improve our winter-fruit will greatly benefit the eastern third of our State.

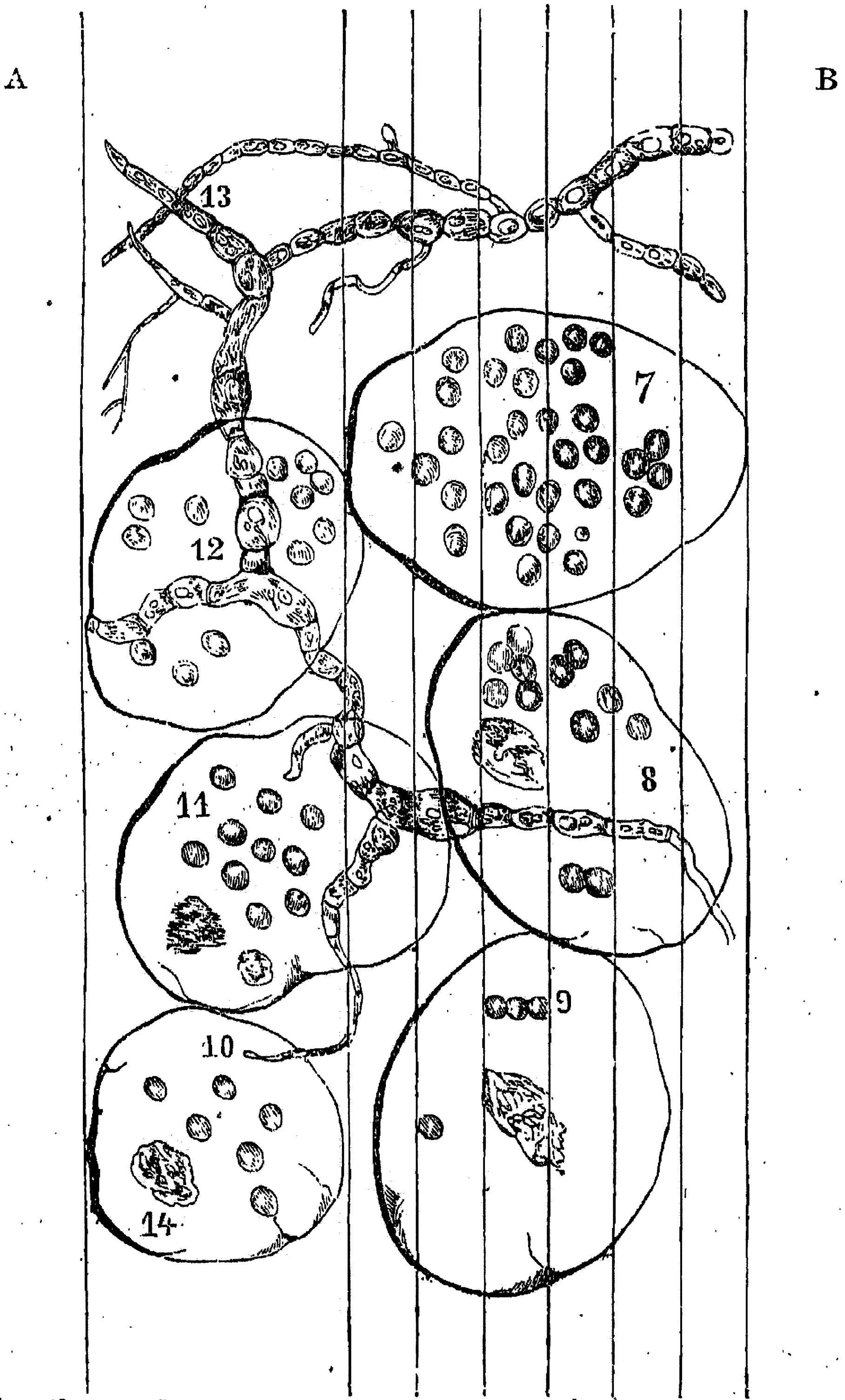
In a subsequent letter to the Commissioner, dated October 8, 1873, Mr. Steel gives the history of the apples alluded to, and forwards a small package of them for examination. He says that the tree which bore them was a graft from the Rochester nurseries, N. Y., and was considered to be one of their best winter-apples. "Here they ripen in August and September, too early to be kept longer than December. The apple is known here as the 'Little Russet.' We esteem it a fine apple, but not a good winter fruit. I have about forty trees from Rochester, and there are several hundred in this county, but they all ripen too early by one or two months. Apples, to keep in this climate, must hang on the trees till November or at least the middle of October; those that fall earlier than this will not keep through the winter. If trees can be procured which will hold their fruit till the 1st of November, we should be pleased to be informed where they can be obtained."

The specimens of the Little Russets, received from Mr. Steel, were subjected to several experiments. Portions of their skin were examined under low and high powers of the microscope. The dotted parts were found to be composed of clusters of circular spores of fungi combined with very small portions of mycelium. Under excessive moisture, and a morbid condition of growth, these fungi would mature rapidly, and produce fermentation in the apple. Some of the apples were cut into halves, and submitted to a temperature of about 70° F. In a short time they dried up, and are now in a perfect state of preservation, thus showing that although they will not keep when whole, yet they may be preserved by allowing a portion of their superfluous moisture to escape. Another portion of the apple was placed in a quart bottle with a glass-stopper, ground to fit, and its moisture was retained. The room in which this experiment was conducted was kept at an average temperature of

70° F. The apple thus inclosed was in ten days in a high state of fermentation. Portions of the rotting pulp were placed on a microscopic slide, divided into hundredths and thousandths of an inch.

Fig. 21, A B, represents such a scale, the larger division, A B, repre

Fig. 21.



senting the one-hundreth of an inch, and the smaller subdivision the one-thousandth of an inch; 7, 8, 9, 10, 11, 12, represent the cells of which the apples are mostly composed. The granular dottings represent apple-starch. The branching cellular structure represents the mycelium of a

fungus penetrating the cells. At 9, three small starch-granules are represented in a line, and are confined within the division of the one-thousandth of an inch. Some kinds of fruit, as the grape, under favorable conditions will eliminate a sufficient amount of saccharine matter to convert them into a candied condition while hanging on the vine, and they are by this natural process preserved from rot. Other kinds, as the apple, cannot be preserved in this way. Apples can be preserved only for a limited time on the tree. Unripe apples are composed mostly of cellulose cells, starch, organic acids, and water. During the process of ripening, their starch is gradually converted into a liquid, which is saccharine. The decay of apples really sets in when their starch begins to become liquid; because the relative amount of sugar produced, when compared with the organic acids and water present, is very small. With a moderate heat all the conditions are presented for ordinary fermentation. The albuminoids being always present in the apple will supply the necessary food for fungi. The cells of the apple sent for examination contained very little starch, and could not therefore be expected to keep well. Apples of good-keeping qualities for the Southern States should be charged with starch as late as the 1st of September, or, still better, the middle of October. Such favorable conditions of growth, it is believed by the most noted pomologists of the United States, can be obtained only by the production of winter varieties of seedlings in the Southern States in which they are to be cultivated.

APPLES FOR THE SOUTHERN STATES.—The opinion has prevailed that the climates of the States south of Maryland are not adapted to the culture of the apple. This erroneous impression is not confined to the best apple-regions of the Northern and Western States, but it has been held by southern cultivators themselves, especially as regards good winter-keeping varieties, when grown in warmer and equally congenial climates.

Southern pomologists have long seen this matter in its true light, and have been quietly but industriously collecting winter-varieties among the seedlings originating in those States, and they can now present a list of winter-apples which, for size, beauty, and quality, are equal to those of any other section on this continent, and possessing, in addition, a peculiar texture and solidity, to be found only in fruit produced in climates where the season of growth is extended and genial, and the winters are of only moderate severity.

The following list includes a few of the most popular summer, fall, and winter varieties known to the Department adapted to the Southern States:

Summer-apples.—Julian, Aromatic Carolina, Large Summer Queen, Red June, Horse Apple, American Summer Pearmain, Summer Cheese.

Fall-apples.—Hunge, Hubbard's Sugar, Bonum (synonym: Magnum Bonum), Cumming's Red, Golden Russet (synonyms: English Golden Russet, English Russet, Russet Golden), Buckingham (synonyms: Queen, Fall Queen, Winter Queen, Kentucky Queen, Lexington Queen, Byer's Red, Frankfort Queen, Ladies' Favorite, Equinetely, Ox-Eye, Bachelor, Merit, Blackburn, Henshaw, Sol. Carter, Ne Plus Ultra, King, Red Horse, Red Gloria Mundi).

Winter-apples.—Walker's Yellow, Camack's Sweet, Boran's Winter, Broadnax, Hall (synonyms: Hall's Seedling, Hall's Red, Jenny Seedling), White Winter Pearmain (synonyms: Campbellite, Michael Henry Pippin), Gladney's Red, Edwards, Payne's Winter, Rawle's Janet (synonym: Neverfail), Limbertwig, Faust (synonyms: Faust's Winter, Foust), Hoyal's Greening, Shockley, Golden Wilding, Clarke's Pearmain

(synonyms: Yellow Pearmain, Gloucester Pearmain, Columbian Russet, Golden Pearmain), Matimuskeet, Nickajack (synonyms: Caroline, Berry, Summerour, Accidental, Red Pippin, Howard, Hubbard, Mobbs, Cheataw, Pound, Edward, Shantee, Wall, Aberdeen, Trenham, Big Hill, Caroline Spice, Cheatan Pippin, Chatham Pippin, Wander, Winter Rose, Red Hazel, Forsythe's Seedling, Ruckman's Red, Alleghany, Chaltram Pippin, Gowden, Graham's Red Warrior, Walb, Winter Horse, Missouri Pippin, Missouri Red, Leanham, Jackson Red, World's Wonder), Gilpin (synonyms: Carthouse, Roman Knight, Small Romanite, Gray Romanite, Little Romanite), Winesap, Aunt Peggie, Disharoon, Winter Horse, Sharpe's Greening, Cullasaga, Ben Davis (synonyms: New York Pippin, Victoria Pippin, Victoria Red, Kentucky Pippin, Baltimore Red, Carolina Red Streak, Funkhouser), Ferdinand, Hemphill, Guilford Red, Green Cheese (synonyms: Green Crank, Southern Golden Pippin, Green Skin, Yellow Crank, Winter Greening, Winter Cheese, Carolina Greening, Turner's Cheese), Gully.

These varieties are supposed to be nearly all seedlings of the Southern States. At page 184 to 198 of the report of the Commissioner of Agriculture for 1869 will be found an illustrated paper by William Saunders on the subject placed at the beginning of this article, of which the preceding is a condensed abstract.

ONION-RUST.

In a recent experiment, made for the purpose of destroying fungus on the onion, the following mode has proved very successful: Some specimens were obtained in the market, covered with amber-colored fungus. I secured one of them in an inverted glass receiver, which I placed over a beaker filled with nitrous acid. The fumes arising from the acid, without the application of heat, enveloped the onion, and soon dissolved and destroyed the fungus covering its surface. In order to ascertain whether the life of the plant had been destroyed, I placed it in a bulb-glass filled with water. It sprouted in a few days, and is now in healthy growth on my desk. It has numerous leaves, which have attained a length of 6 to 12 inches; thus showing conclusively that, in some cases, fungoid growths may be effectually destroyed without injury to the plants on which they grow.

This principle admits of many important applications. In some diseases of the potato the surface alone appears to be affected, and the same is true in regard to certain diseases affecting the tubers, roots, fruits, and grains of various other plants, any of which may be readily exposed in large quantities to the fumes of nitrous acid. As nitrous acid has the power of depriving organic bodies of their oxygen, its destructive action on fungus is probably due to this property. The extent to which this treatment may be safely applied to the smaller grains will be the subject of future experiment.

TESTS OF DEPARTMENT SEEDS.

The value of the system of distributing seeds may be estimated by the aggregated experiments from time to time published. An end attained by the system, in addition to improved qualities of particular products and material percentages of increase on given acres, is the turning of the farmers' attention to the importance in itself of experimenting. In respect of the character of reported experiments there

has been much improvement within a few years, due in a considerable degree, no doubt, to the intelligent conduct of the agricultural press, which has not failed to arouse the agricultural community to a closer inspection of the details of the operations of the farm. Considering the great diversities of climate and soil in this country, the varieties of agricultural methods, the nice requirements of adaptiveness, the skill and intelligence requisite for conducting tests methodically and well, and the comparative newness of systematic experimentation among our farmers, it is not always easy to form a correct and final judgment as to the fitness of particular varieties to particular sections. It is readily understood why the experiments coming from so many farms in the land must lack in exactness, affording no room for the tabulated statements of the statistician, or the inferences of the laboratory. Primarily, the farmer wants that to put in the ground which with the least labor will yield satisfactory results in profits. He can tell us of the methods he pursues to get the best crop, and what advantages in results a seed of one kind possesses over another on his land, and whether one variety or another bears up under peculiar vicissitudes of frost or drought, storm or sunshine. We can expect no more, and, perhaps, for ordinary and practical purposes this is enough. Upon these reported experiments chiefly the Department is obliged to base opinion, and continue or leave off, extend or confine, the distribution of particular kinds or classes of seeds and plants.

It is claimed in California that the State has prospectively gained many millions on account of experiments in agriculture carried on during the last ten years. Among others are the settled facts arrived at concerning the dry-sowing of wheat-land—a way having been found whereby to produce a good crop with the smallest possible quantity of moisture from rain-fall; the best and cheapest methods of reclaiming swamp-lands, by which a vast body of unproductive lands may be raised to rank among the most fertile in the State; the proving of the fact that cotton and other valuable textiles and tobacco could be profitably cultivated. Referring to the latter, the result of one experiment in 1872 was the production of fifteen hundred pounds per acre, at a cost not above 4 cents a pound, which was worth in the market at no time less than 50 cents a pound. And again, reliable grasses were a necessity; the native kinds were disappearing; overstocked grazing-lands and sheep-walks were failing; something was wanted to withstand the droughts; hay-crops from the annual oats, barley, and wheat could not be depended on. But, out of nearly one hundred experiments in propagating grasses, says an intelligent writer of that State, one was particularly successful, but that one compensated for all the other failures. He refers to alfalfa as the one perennial grass which, perpetuated by the roots, when well set in is proof against the dryest season; and an acre which would hardly sustain a sheep before will now, with alfalfa, support fifteen, or five head of cattle. Experiment thus led to the discovery of the agreeable fact that without irrigation the meadows might be clothed in perpetual verdure.

It is of consequence to farmers to keep up by diligent cultivation and scrupulous attention the excellent qualities they may find in any particular variety, whatever it may be, or if worth raising at all. It is sufficiently evident that what are known as deterioration of seeds and degeneracy of varieties are in most cases only other names for want of thrift and inattention to the plain necessity of preserving by judicious methods what is good and approved. Let farmers sift out yearly the largest grains for seed, and, if the cereals be in question, go back occa-

sionally to a single head of superior quality, and from the cultivation of this seed re-instate the variety in its original purity. If such a course is pursued, and the elements necessary to the plant-growth are supplied to the soil, there is no reason why a variety may not be cultivated for any length of time without deterioration. It is not uncommon for the experimenter with a fresh and vigorous variety among the cereals, textiles, fruits, &c., to be exultant after the first success, and in a few seasons to become clamorous for something new—to go through the same process of degeneration.

One of the most popular varieties of oats raised in certain districts of England and Scotland has been the Potato oat, a variety which this Department has sought to test fairly in this country. In regard to it Loudon, in his Encyclopedia of Agriculture, quotes the British agricultural writer, Brown, who says:

> Degeneracy to a certain extent has taken place in the Potato oat; but it is presumed that the consequences might be removed with ease were first principles returned to. To make a selection of the strongest ears, which carried the purest grain, is not a difficult business; and were this selection attended to by half a dozen farmers in a district, it is obvious that the breed or variety might be preserved pure and uncontaminated. If slovenly farmers were not provided with good seed, it would be their own fault; since, if they would not take the trouble to select and breed for their own use, they might always be provided by those who were either better qualified for making the selection, or were more attentive to the interests of agriculture.

Mr. Allen, in his "New American Farm-Book" (1869) says that repeated trials have been made with the Potato oat, a heavy grain, weighing from thirty-five to forty-five pounds per bushel, but its merits have not proved conspicuous enough to have given it the place of the old and long-tried varieties in the United States.

But, during the time in which the Potato oat has been on trial, through the medium of the Department distribution of seeds imported from Scotland direct, very gratifying results have been attained. After four years' trial in Marshall County, Michigan, this oat was reported in 1870 to be a decided improvement on the common varieties, weighing forty-five pounds while the common weighed from twenty-eight to thirty-two pounds per bushel. In Wisconsin the yield was at the rate of seventy-two bushels for one sown by drill; in Ashtabula County, Ohio, sown in drills 8 inches apart, on turf, one hundred and fourteen fold, and in quality far superior to any oats ever grown in the vicinity. It will be borne in mind, however, that these were experiments on a small scale, very carefully conducted, and must be considered as extraordinary. The capabilities of the oats under most particular treatment are shown. In Wabash County, Indiana, season of 1871, the weight was forty-five pounds, although somewhat damaged by drought, and in Elkhart County, from a second sowing of one quart, twenty-one quarts were raised, at the rate of fifty-three bushels per acre, while other oats on similar soil yielded forty bushels per acre. In Onondaga County, New York, under favorable circumstances, fifty bushels per acre, weight thirty-six pounds per bushel. And here the question may be left, awaiting further experiment for its elucidation.

In view of the changed aspects of agriculture at the South and the manifest desire to cultivate corn and wheat more extensively, it has been a matter of concern to the Department to introduce reliable varieties. To what extent success has been reached the experiments published herewith and those contained in the report for last year, will go far toward showing. The editor of the Rural Alabamian recently said that he was receiving many inquiries from different parts of the South as to the best mode of cultivating wheat, while in regard to grasses the inquiries are

almost of daily occurrence. One of these correspondents says he has been growing wheat for many years and finds that from six to eight bushels per acre is about the best he can do, and asks, "How can I manage to get a paying crop? Or, must I give up trying to grow wheat?" To this the answer is very appropriately made:

We know that wheat can be made profitable in the South, because it has been. The climate and a large portion of the soil, even in the Gulf States, are as well adapted to the growth of wheat as those of any portion of the world. The whole difficulty lies with the planters themselves in the mode of cultivation. In the first place, not sufficient importance is attached to the wheat-crop, and the best land and the best culture are appropriated to cotton. The poorest, worn-out land, such as has ceased to produce cotton, is usually selected as good enough for wheat. The ground is prepared late and in a hurry, is half-broken up, lumps and tufts of grass are left unbroken on the surface, no manure applied, the seeds sown broadcast and scratched in, and the crop left to shift for itself. Such cultivation will never produce a paying crop of wheat. Now all that is needed to insure a crop of twenty-five, thirty, or even forty bushels to the acre is the right kind of culture; and it is just as easy to cultivate right as wrong, and costs but a trifle more.

In this connection attention may be called to the importance of preserving seed. The Department is not a seed-warehouse, intended for the supply of every individual according to his pleasure, but a source from which small supplies of well-chosen varieties may be procured for experimental purposes. A plan adopted by a county agricultural society in Tennessee is a very good one, and worthy of imitation by communities as well as by other societies of a similar character; that is, the plan of requiring every member who has received seeds for experimental purposes from the Department to return to the society at least as much as the quantity received, if experiments turn out favorably. In addition to the convenience of having the seeds of valuable varieties on hand for seasonable distribution, the advantages of gradual adaptation are gained. As opposed to this provident method, (a case already cited in one of the monthly reports of the Department,) a Virginia correspondent mentions that in his neighborhood many persons are always anxious to get *choice* varieties of seeds when first introduced, with grave promise of submitting them to the fairest tests; but the novelty having worn off, or indifference to the objects of the distribution supervening, nothing more is heard of them, unless, perhaps, in some cases where the farmer, not having been diligent and conscientious in cultivating the seeds, meets failure and denounces what he has received as worthless. The following, as a printed circular, is sent to persons who are the recipients of seeds:

The object of the Department is to distribute seeds as widely as possible; and, if they prove valuable, it is expected that their product will be saved and distributed to others by the first recipient. It is impossible, therefore, to supply many persons in the same vicinity, nor will those who do not save the seed, as above suggested, be entitled to further supplies.

WINTER WHEAT.

TAPPAHANNOCK.—The results of experiments with this wheat, which for several years has been distributed by the Department, have been published from time to time in the annual and monthly reports. And these so clearly established the character of the wheat and demonstrated its adaptability to the requirements of several parts of the country, that last year it was not considered necessary to publish further experiments at length. However, the uniform success attending the cultivation of the wheat, and the evident satisfaction of experimenters in the Eastern, Southern, and several of the Western States, have persuaded other persons to make a trial of it. This fact, and the conviction that

a variety having excellences so desirable and advantages so unmistakable ought to be as widely distributed as possible, led the Department to again distribute Tappahannock, with reference especially to accommodating as far as practicable those localities into which the wheat has not yet been carried, or, if so, to a limited extent. During the year some reports adverse to the qualities usually accorded to the variety have been received, but in several of these cases, at least, the seed was not of the pure selection sent out by the Department, but that of successive crops, cultivated, as ordinarily, without especial care as to preserving the original integrity of the wheat.

Experiments, 1873.—In the county of Grand Isle, Vermont, four quarts sown thinly, September 11, produced three bushels of excellent wheat; harvested July 8, from two to three weeks earlier than Diehl. The experimenter regards it as an improvement on the varieties raised in that locality. The weight of this wheat per bushel in Bristol, Massachusetts, was sixty-five pounds. In Dauphin, Pennsylvania, it yielded well, and ripened one week earlier than other varieties. Seven pounds sown on red land, which had been used for the site of a hay-rick for five years, germinated exceptionally well, yielding one hundred and fifty pounds, or over twenty-one-fold, notwithstanding the drawbacks of wet weather and insect enemies. The following experiment, made in Moore, North Carolina, shows care on the part of the farmer, and indicates the capabilities of this wheat under favorable conditions:

Two quarts were sown on thirty-three rods of ground about the 1st of November. The land had been cultivated in potatoes the season before; lightly fertilized then with stable and barn-yard manure. When the potatoes were dug in the fall the ground was left in a condition similar to light plowing. The wheat was sown immediately, with a half-shovel plow, in drills, by running a furrow around the land, and then sprinkling a light coat of stable and barn-yard manure and yarddirt in the furrow. The sowing allowed the wing of the plow to cover all the grains. Nothing more was done until harvest-time. Yield, one hundred and twenty quarts, or sixty-fold. Other varieties did not approach it in any sense as to prolificacy and excellence of quality. It is the best seed yet sown in this part of the country.

A miller of Fulton County, Georgia, certifies that four measured bushels of the wheat, (which was raised on upland, from seed furnished by the Department,) weighing two hundred and seventy pounds, yielded one hundred and twenty pounds of No. 1 flour, forty-five pounds of No. 2, and fifty-three pounds of Nos. 3 and 4, or an average of fifty-four pounds to the measured bushel. In Gordon, same State, six quarts were sowed November 25, on thin upland well prepared and manured with stable-dung. It ripened a week or ten days earlier than other wheat. Being intended for seed, it was allowed to become "dead-ripe," and was cut June 16, yielding four bushels, or at the rate of twenty-one and one-third fold. The general average yield of wheat in the same locality was from two to four fold; none over the latter figure. In Clark, Mississippi, two quarts were sown on common, flat, pine-wood land well subsoiled, the ground employed being the one-tenth of an acre on which fifty pounds of guano was put in with the wheat; product, three bushels, or forty-eight-fold. "Here," says our correspondent, "this wheat needs only proper management to pay better than cotton." An experiment in Pope, Arkansas, gave, on sandy-loam soil, lightly sprinkled with barn-yard manure, afterward plowed in, two and a half bushels from four quarts sown, or twenty-four-fold; a yield much superior to that of any other variety in the locality. Reports equally favorable come from Washington and Independence counties. In Lincoln, Tennessee, a yield of twenty-five bushels per acre, with common cultiva-

tion, is reported; but in Montgomery, where sown on river-bottom land late in October, the wheat did not come up well and was attacked with rust and scab.

Concerning the continued cultivation of Tappahannock in Ohio, Mr. G. S. Innis, of Franklin County, says:

In 1858 the Department sent me one-half bushel of Tappahannock wheat, which I sowed carefully with a drill and obtained twenty-two bushels, although wheat in the county did not average five bushels per acre on account of a severe frost on the 6th of June. This wheat, being earlier, escaped the frost as well as the red weevil, then our great wheat enemy. The next year I sowed a portion of the product on eight and a half acres. It yielded forty-two bushels per acre. Those to whom I had distributed seed raised good crops; some thirty-five bushels per acre, none less than thirty. Thousands of bushels of it have since been raised in our county, and always with success. * * * Its flour makes most excellent bread.

A farmer of Defiance County, in the same State, writes:

I have cultivated the Tappahannock six years in succession with good success, finding it well adapted to our soil and climate. The straw being very stiff, it is less liable than others to lodge on our bottom-lands. The average yield per acre since I have cultivated it has not been less than twenty-two acres; besides, it is from ten days to two weeks earlier than other varieties.

A correspondent in Labette, Kansas, sowed broadcast one gallon of Tappahannock wheat, September 10, on high upland prairie, the land having been twice in corn and once in wheat. It ripened early, was free from rust, and was not much injured by insects. Yield, twenty-two gallons of fine wheat. In the neighborhood, a farmer sowed forty bushels of Tappahannock on similar soil, and harvested twenty bushels per acre. Another sowed on river-bottom, and obtained twenty-seven bushels per acre. On the other hand, a farmer in Nemaha sowed his seed in the latter part of August, covering it 5 inches deep. It came up well, making a fine growth until February, when continued extremes of thawing and freezing killed it almost entirely. This was the second failure, the cause assigned being in both cases the same. A farmer in Saline also complains of failure. He sowed carefully in drills by hand on the 1st of October. The wheat came up and looked as well as other varieties sown at the same time. The seed sown by the farmers in Labette, from which twenty and twenty-seven bushels per acre respectively were harvested, was purchased in the Saint Louis market, and was probably a product of successive plantings in that region. The experimenter in Saline planted seed which was raised in Maryland and sent to him by the Department. At the same time he sowed and similarily treated Touzelle wheat, from the Department, and this experiment also resulted in failure. His main crop, on the same ground, was of mixed white wheat, chiefly Genesee and Blue-stem, sown two weeks earlier, and these stood the winter and yielded well. These varieties, he says, had been sown for several years in that locality without any instance of notable failure. During the progress of the above experiments, it may be added, the winter and early spring months were very severe on autumn crops, and efficient early spring work was interfered with.

FULTZ.—This wheat, which bears the name of the gentleman on whose farm, in Pennsylvania, it originated and was first cultivated, was distributed by the Department in 1871, but to a limited extent. The accounts from that distribution being favorable, it was again sent out, in 1872, in larger quantity and over a wider area. Reports of experiments were published in the last annual report, making an exhibit in favor of the claims made for the wheat that was even above expectation. As stated in that report, it was especially intended in the selection of this variety to add an impulse to wheat-culture in the Southern States by furnishing an early, hardy, prolific, and reliable kind, calculated to in-

spire confidence and stimulate endeavor. Reports of trials made were received from a majority of the States of the South. The yields rarely fell below twenty bushels per acre, in many cases reaching forty and more, and the average weight per bushel was fully up to sixty-four pounds. As heretofore described, this wheat is nearly smooth, with beards occasionally; is very evenly six-rowed; the straw stands well, the chaff very close and adherent; the grains are short and plump, and in color a light dull red or dark white.

Experiments, 1873.—As showing the advantages of light over heavy sowing, the experience of a writer in an agricultural journal of West Virginia, who employed Fultz wheat in his experiment, is here given in full:

In the fall of 1871 we sowed an eighth of an acre in wheat for experimental purposes. The variety was Fultz, and the first sample we had seen of that variety; quantity of seed used, one gallon, or at the rate of one bushel to the acre. This was thin seeding with us, the minimum quantity sown being one and a half bushels per acre. The ground was an old meadow, cultivated one year in corn. The corn was taken off, and the ground twice harrowed and top-dressed with two loads of stable-manure, and the seed put in with a double plow early in October. It did not make much of a growth in the fall, nor did it start very vigorously in the spring. With a tolerably favorable season, "tillered out" pretty, and at harvest was not much thinner than where the usual quantity had been sown. The yield quite surprised us, being one hundred and eighty pounds of wheat, and two hundred and twenty-four pounds of straw, equal to an average of twenty-four bushels per acre; while the wheat seeded one-half thicker, on similar soil, yielded fifteen bushels per acre, a gain of nine bushels per acre in the yield and a half bushel of seed saved besides. The yield of straw was not quite so heavy as where it had been more thickly seeded, being less than a ton per acre. I think that the success or failure of thin seeding will depend very much upon the season, during the months of April and May, following the sowing. If the weather is unfavorable during that period it will not tiller enough to make a fair stand, and of course if the number of stalks upon the ground is very small the chances for a large yield are correspondingly reduced. By thin seeding I mean a bushel of wheat, or less than a bushel, per acre.

In Waldo, Maine, four quarts returned seventy-six of excellent quality. A very favorable experiment is reported from Adison, Vermont. As reported last year, this wheat yielded thirty bushels per acre in New Hampshire.

Reports from two counties in New York name yields respectively of sixteen and eighteen fold on the amount sown. A yield of twenty-four bushels per acre is reported in Gloucester, New Jersey, and of thirty-two bushels in Salem. In the latter case Delaware Red wheat in the same field returned only eleven bushels per acre. In Bradford, Pennsylvania, twenty-five bushels per acre were raised, weighing sixty-one pounds per bushel; and in Lawrence, on land not manured, one quart yielded twenty-three, the quality being superior. A Dauphin County farmer was not successful, for reasons not specifically noted. He sowed October 3 on sandy loam, using no fertilizers; soil, a clover sod. He does not consider the product "worth preserving for another trial." In the adjoining county as high as forty-five bushels per acre have been raised, and in the county second in range southwest thirty and thirty-five bushels per acre.

Several farmers in Frederick County, Maryland, sowed small lots of the Fultz wheat, and in each case report satisfactory results; that it exceeded all other varieties in yield per acre, in weight per bushel, and all, except the Tappahannock, in quality. One correspondent says that it is beyond doubt the most promising variety in the county—admirably adapted to the climate. At the date of harvesting he was satisfied that he could pick out acres of it that would yield thirty-five bushels and over, and was confident of an average of thirty bushels per acre. Commercial fertilizers are generally used in the county. In Saint Mary's,

where the wheat was sown on poor land early in November, top-dressed with tobacco-stalks to protect it through the winter, the yield was twenty-four-fold. Two bushels in Howard returned thirty-seven, although the crop was injured somewhat by the fly. It stood the winter well, while the Lancaster Red, the variety generally seeded in the county, was badly injured. The Fultz raised by this farmer last year weighed sixty-six pounds to the bushel. This year he omits a statement of weight. In Carroll, two quarts yielded one bushel and a half, quality equal to the seed. It yielded more on an average than Lancaster Red sown alongside, than which it had stiffer straw and larger head.

Twenty experiments in Virginia, additional to the more than forty of last season, are proof of the adaptation of the wheat to that State, and of its growing ascendency over the varieties commonly seeded. It may not be invidious here to say that wheat-growers in Virginia appear to be particularly painstaking in their tests of new cereal varieties, nor are they in anywise dilatory in making known results. The records of the Department for several years show a larger number of reported experiments with new varieties, more especially in wheat-culture, from this than from any other State. This aroused interest is certainly a harbinger of advancement and success. Of the experiments with Fultz, Lee County, this year, reports three, with yields per acre respectively of twenty, twenty-four, and thirty-two bushels. In Albemarle there was a yield of thirty bushels per acre; weight, sixty-four pounds; quality superior to that of kinds usually grown. In the same county the grain was sown on ordinary tobacco-land fertilized by a light coat of plaster mixed with leached ashes and hen-manure, which was plowed in with the wheat. The growth was strong and luxuriant, somewhat taller than ordinary wheat; yield, at the rate of fifty and one-fourth bushels to one sowed. In Craig, yield and quality unprecedented, and from five to six days earlier than other wheat; Nelson, yield at the rate of thirty-three and a half bushels, and better than others; Culpeper, two experiments, ripened earlier than other wheat, and, in one case, yielded double in quantity compared to others; Goochland, thirty-three to one, other wheat alongside yielding twelve to one; Orange, forty bushels per acre, weighing sixty-two pounds per bushel; Essex, the yield on lands not fertilized has averaged twenty-nine and one-half bushels for one seeded; it is generally seeded one-half bushel per acre, and "branches" more than any other wheat. The Halifax County Record refers to a product of eight and one-half bushels from one peck sown in that county, and says: "We have always considered ten bushels for one of seed a very satisfactory yield, but this Fultz wheat raised by Mr. Cosby yielded at the rate of thirty-four bushels for one."

Accounts from North Carolina are, without exception, favorable. Referring briefly, by county, to experiments: Lincoln, considered twenty per cent. above the average as to yield, quality, and straw; Greene, forty-five bushels per acre, weighing sixty-five pounds per bushel; Caldwell, fifty per cent. better, as grain, than the varieties usually grown; Alamance, far exceeds other varieties in productiveness and quality; weight, sixty-two pounds; Dickson, in quality above an average; yield, thirty bushels per acre; Buncombe, (before harvesting,) "put in by different persons and on different soils, looks very well on strong, deep, stiff, mulatto-soil, and, if manured, on gravelly gray soil. Other varieties are considerably winter-killed on loose, open, porous soil." Another correspondent says:

I look upon it as the best wheat for Western North Carolina. It spreads more than any wheat I have seen, several bunches having from twelve to fifteen stalks, with very long heads, measuring from four to six inches; the straw is stiff, and perhaps as free from rust as that of any wheat grown here.

A farmer of Greenville County, South Carolina, writing before harvest, says:

One of the grains of Fultz wheat produced fifty-six stalks, averaging 3 feet high; size of leaf one foot long by three-fourths of an inch wide. Each head contains thirty grains, an increase of 1,680-fold. It has no rust, and is now so far developed that it is independent of any drawbacks from any fluctuations of weather. It looks fair and beautiful, a proof that it is in the right belt of earth and climate.

A planter of Sumter County says there has been no wheat sown in his vicinity for several years on account of liability to rust; but the trial of Fultz this year proved a success.

In Gordon, Georgia, one quart, sowed on .32 of an acre, returned two bushels, for that region unprecedented. Dawson, one gallon, without any extra preparation of the soil, yielded seven bushels, or twenty-eight-fold. Lumpkin, twenty-four bushels per acre; superior to any wheat common to the locality. Fannin, sixteen bushels, and pronounced a hardy wheat for the severe winters, maturing about as early as the most forward wheats. Murray, about 10 per cent. better in yield and quality than the best common varieties.

In Sullivan, Tennessee, twenty-three bushels per acre; weight sixty-three pounds; increase seventy-fold.

A correspondent in Marion, West Virginia, reports that he harvested thirty pounds from one and a half sown in 1872, and, re-sowing the product, his yield in 1873 was four hundred and ninety-five pounds, weighing sixty-four pounds to the measured bushel; land of medium quality not manured.

Several farmers of Metcalf, Kentucky, unite in saying that the yield is more than double that of any other wheat within their knowledge, in proportion to the amount sown.

Sown October 2, about twenty days later than the usual time for sowing, on prairie-land in Lewis, Missouri, it stood the winter without damage, while all other varieties froze out. Harvested June 29, it yielded 20 per cent. more than other wheat. In Perry it yielded at the rate of thirty bushels per acre.

The following are the results of a number of experiments made in several of the Western States: Illinois, in Scott it sustained no injury from the coldest winter known for a number of years; but in De Kalb, where sown in September, and a fine, rank growth attained in the fall, it was entirely winter-killed. In Indiana, sown on black, loamy soil, fertilized with slaked lime, four quarts on one-eighth of an acre, by machine, yielded at the rate of forty-five bushels per acre, weighing sixty-two pounds; average yield of wheat in the county, fourteen bushels. On limestone soil, clover plowed in the year before, yield, twenty-seven bushels per acre, weighing sixty and one-half pounds; in Carroll, a second season's sowing of two quarts, broadcast, on black loam, produced ninety bushels. Michigan, Mecosta, yield twenty-five per cent. more than the standard varieties of the locality, and Alcona, twenty-five bushels for one. Wisconsin reported yields of thirty and thirty-two bushels per acre, weighing respectively sixty-five and sixty-three pounds per bushel. Kansas, Labette, one-half bushel on one-third of an acre of high, upland prairie, ripened six days in advance of other early varieties, and escaped chinch-bugs; yield, eleven bushels of plump grain. Escaping the chinch-bug, it a valuable addition to the cereals of Labette.

In Dakota Territory a yield of twenty-five bushels per acre is reported. The experimenter says: "This wheat should be sown under corn, about the beginning of September, and the corn be allowed to stand until

spring, to retain the snow." Three experiments in Utah are, respectively, favorable to the wheat; in one case (harvested two weeks earlier than other winter varieties; yield thirty-nine and thirty-two bushels per acre, weighing sixty-two and sixty-one and a half pounds.

TOUZELLE.—A French white winter variety, beardless. It was first distributed by the Department in 1869. While this wheat is beautiful in appearance and excellent in quality, and has returned in many instances exceptional yields, the superior merits of Tappahannock and Fultz, combining earliness of maturity with prolificacy and hardiness, have overshadowed it. In the report for last year the statement was made that this wheat, judged by the experiments reported, was adapted to those regions where winter-wheat is the more successful, but in which much sturdiness of growth is not requisite. Experiments were cited which had been made in Virginia resulting in yields of thirty, thirty-two, and fifty bushels per acre, and weighing as high as sixty-six pounds to the bushel. The reports received during the present year are neither as numerous nor, generally speaking, as favorable as last. The more significant on either hand are epitomized, and attention called to the references under the head of "Varieties of wheat compared." In Franklin, North Carolina, yield twenty bushels per acre; Caswell, seventy-two-fold increase; Forsyth, failed on account of midge and frosts; Orange, injured by hard rains while in bloom, causing scab; Henderson and Mitchell, winter-killed. In Lowndes, Georgia, escaped rust, and considered suited to the climate; in Whitfield, stood the winter well, and yielded twenty-fold; Gordon, winter-killed; Cobb, a failure. In Greenville, South Carolina, "though sown before Tappahannock and Fultz, ripened a little later, and took the rust in the head, which the others did not." In Bell, Texas, twenty bushels per acre; in Rusk, rusted badly; in Kauffman, better than red May wheat. In Marion, Tennessee, the land was thoroughly prepared, and the seed planted both in drills and broadcast, and carefully cultivated, but not as much seed was harvested as had been sown, destroyed by rust and scab; Knox, average yield. Mr. T. E. Brawder, of Logan County, Kentucky, says:

> The Touzelle was seeded late, but came up well and passed through the winter so as to make a very good stand in the spring. The entire wheat-crop of this part of the State was very much injured by the excessive rains of May and June; but this wheat was injured more than any other variety. It filled very imperfectly with defective grains, and made a very light yield of inferior quality. I am inclined to think it will not suit this country.

In Owsley, same State, it failed altogether; attacked by rust when in bloom, and did not mature. In Fayette, West Virginia, complaint is made of lateness in maturity and weakness of straw. But in Richmond two quarts produced, on one-eighth of an acre, three bushels of good, sound wheat. The wheat made a fine appearance in Westmoreland, Pennsylvania, during fall, but suffered severely from the frost during the winter; straw bright and clean, but weak and liable to lodge. In Delaware, twenty-two bushels per acre. In Wabaunsee, Kansas, was a total failure, as it could not stand the winter; came up well, making a good stand, and did not freeze out until winter.

ARNOLD'S HYBRID, NO. 9.—Mr. Charles Arnold, of Ontario, Canada, has been for several years conducting experiments with wheat with a view to originating new varieties by means of hybridizing, or, properly, cross-breeding. He states that from upward of a hundred varieties carefully crossed with the Michigan Amber for the female parent and the White Soules for the male, he reduced the number of selected kinds to nine. These he believes to possess all the good qualities of both

parents, resisting the midge through the overlapping of the chaff or glume, and from the short time the glume remains expanded after fructification has taken place; and, also, having the size of head and grain of the Soules, with increased vigor and hardiness to stand the winter, with strength of straw without overluxuriance. A committee appointed by the Board of Agriculture of Ontario to examine the claims of Mr. Arnold's new wheat, after an examination, said:

It was found that all the varieties had stood the winter well—quite as well as the Soules and Blue-stem—and much better than the Amber Michigan and Treadwell wheats. At a later period, when the Arnold came into ear, it was evident that they were really new varieties—cross-bred—and inheriting some of the valuable qualities of both parents, that is, they seemed to have the midge-proof character of the Amber Michigan, while Soules' parentage had greatly improved the quality of the grain as compared with that of the Amber Michigan. Another important fact ought to be stated, viz: the ears of the new varieties were much larger than those of the parent kinds, while they had even more than the compactness of the Soules wheat. The yield per acre was large, being, as Mr. Arnold says in his appended statement, fifty-two bushels per acre. This return was not the result of extra culture; the land was not better prepared than any good farmer would deem necessary for a good crop.

Desiring to introduce for experimental purposes in this country a good variety of Canada wheat, the Department procured from Mr. Arnold himself about one hundred bushels of his Hybrid No. 9, and distributed it in two-quart packages in time for the fall sowing in 1872. This wheat is on the trial of its merits here, and it is hoped that farmers will make it a fair one. Up to the date of closing this article the reports concerning the wheat have not been numerous.

In King and Queen, Virginia, four quarts sowed broadcast, October 10, on ordinary land with dressing of stable-manure, yielded seventy-two quarts—better grain than seeded. In Livingston, New York, two quarts sown on gravelly loam yielded fifty-six quarts, which ripened eight days earlier than Treadwell; straw stiff. Montgomery, Pennsylvania, eight quarts drilled on one-fourth of an acre yielded one hundred and sixty-eight quarts, weighing sixty-three pounds per bushel; straw stiff, and about one foot higher than White Chaff Mediterranean; in Crawford one quart yielded twenty-one and one-third quarts; sown broadcast September 13, on five and a half rods of gravelly soil, coarse manure plowed under; harvested July 19. McLean, Illinois, hardier than other varieties; Sangamon, stood the severe winter well. Ripley, Indiana, stood the winter well, and ripened five days before Mediterranean; hardy and prolific; Orange, yielded at the rate of twenty and a half bushels per acre, sown broadcast; remainder of the field, in other wheat, yielded at rate of twelve bushels per acre; Hendricks, yield sixteen fold, but injured by excessive rains; straw soft. Huron, Ohio, drilled in September 11, side by side with Tappahannock, on old pasture, gravelly soil, broken up twelve days before sowing; came up twelve days before Tappahannock, and was ripe July 8; yield, thirty bushels per acre, and the crop a fine one; no great difference between the two except that the Arnold was beaten down a little more by the rains, and was four days the later in harvesting; in Morgan it yielded sixteenfold. It grew well in Dodge, Nebraska, during the fall, but was altogether winter-killed. In Juab, Utah, a correspondent pronounces this wheat the best yet seen in that part of the country. In Louisa, Iowa, it could not bear up under the severity of the winter. Sown by several parties in Green Lake, Wisconsin, it was in each instance winter-killed. In Dearborn, Indiana, it was for the most part destroyed by rust and midge. A correspondent writing from Harrison, same State, is inclined to think, from a single experiment made, that this wheat is too rank in its growth of straw to be desirable for that

latitude. He premises, however, that in this instance the wheat was badly injured by a storm, the experiment having been by no means a fair test.

SPRING-WHEAT.

RED MAMMOTH.—Quantities of this wheat, grown in Illinois, were distributed for experimental purposes in the winter of 1871.

Experiments, 1872–'73.—Livingston, New York, ripened ten days later than Rio Grande; quality good and yield fair. Scott, Illinois, twenty-five bushels per acre, weighing sixty-two pounds; in yield and time of growth similar to other varieties, but grain superior. Crawford, Wisconsin, yielded sixteenfold; not as good as the wheat now in cultivation; on high ridge land, yield light; on rich valley, fair. In Waupaca yield from two to five bushels per acre more than other varieties, and of superior quality; sown on rich prairie-soil in Fond du Lac, yield at the rate of thirty bushels per acre; straw large and stout; berry much resembling Rio Grande. Green Lake, twenty bushels per acre. Douglas, Minnesota, twenty-five bushels per acre, weighing sixty-four pounds; "yield rather more than the common wheat, quality a little superior, and time of growth a little earlier;" yield per acre in Fillmore, twenty-six bushels; no fertilizers used. Reports from nine counties in Iowa are, without exception, favorable. Dubuque, forty bushels per acre; Linn, sown at the same time, ripened two weeks earlier than other varieties, and, while they were affected by blight, this wheat escaped it entirely; Pottawattamie, planted on newly broken soil by the side of the variety usually grown, it presented a much finer appearance throughout the season, the straw being larger and stiffer and the heads better filled. A correspondent, writing from Marshall, Kansas, says: "It is decidedly the best spring-wheat sent to this country. From four quarts, sown with garden-seed drill, seven and one-half bushels of clean wheat, fully up to standard, were gathered; straw long, and very bright and fresh." A yield of twenty-four bushels per acre is reported in Washington, Nebraska; straw about three feet in height; did not lodge; product excellent.

Experiment on the farm of the State University of Wisconsin.—To test the value of different amounts of seeds to the acre, eight adjacent plats, of one-fourth acre each, were sown April 30, to Mammoth Spring wheat, grown upon the farm. The following table shows the result in the years 1871 and 1872:

Bushels of seed to the acre.	Weight of straw and grain.		Weight of grain.		Weight per bushel.		Yield per acre.		Per cent. of grain to weight of straw and grain.	
	1871.	1872.	1871.	1872.	1871.	1872.	1871.	1872.	1871.	1872.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Bushels.*	*Bushels.*		
¾	820	....	263	....	60¼	....	17.53	....	32	....
1	899	938	297½	200½	60⅔	54	19.83	13.33	33	21.37
1¼	1,146	1,084	332¾	243	60	56	22.18	16.20	29	22.41
1½	1,340	822	396½	201¾	60½	56½	26.16	13.45	29	24.54
1¾	1,330	704	375¾	190½	60	56½	24.75	12.7	28	27
2	1,412	790	455½	218¾	60½	57½	30.33	14.5	32	27.6
2¼	....	670	....	174	....	58	....	11.6	....	26
2½	....	728	....	216¼	....	59½	....	14.4	....	29.7
3¼	....	750	....	238	....	59½	....	16.87	....	31.5

Explanatory, Professor Daniells says:

By reference to this table it will be seen that in 1871 the yield per acre increased (except plat 5—two bushels shown—which was more badly laid than the other plats)

as the seed was increased from three-fourths to two bushels per acre, while the yield in 1872 seems to bear no relation to the amount of seed sown. The maximum yield is given by one and one-fourth bushels of seed; next the maximum by two and three-fourths bushels, and the minimum by two and one-fourth bushels to the acre. No reason can be assigned for this want of uniformity in the results, unless it may be attributed to the severe drought of the past summer. Nor is it plain why each plat should not have been affected alike, as they lay adjacent and nearly upon the same level.

In the season of 1873 Professor Daniells sowed four adjacent plats of one-half acre each in Red Mammoth wheat, May 5. Weight of one bushel of seed, 56 pounds. The following table shows results:

Bushels of seed to the acre.	Weight of straw and grain.	Weight of grain.	Weight per bushel.	Yield per acre.	Per cent. of grain to weight of straw and grain.
	Pounds.	*Pounds.*	*Pounds.*	*Bushels.*	
1½	2,338	546	56	18.2	23.8
2	2,514	521½	56	17.3	20.7
2½	2,478	547½	55	18½	22
3	2,667	546¾	53½	18.2	20.5

All these plats were somewhat injured by the chinch-bug, plats 3 and 4 more than the others. Plats 2, 3, and 4 were lodged, the last being nearly one-fourth down, causing the straw to rust badly. On the first plat 1 pound of seed yielded 13 pounds; second, 9.3 pounds; third, 7.8 pounds; fourth, 6.5 pounds.

VARIETIES OF WHEAT COMPARED.

There can be no better test of the relative merits of varieties than the cultivation of them under similar conditions—"alongside," as many of our farmers say. If experiments of comparison be judiciously managed and continued through successive seasons, the results will be determinate enough to enable a farmer to decide upon good, better, or best; and knowing the best, all things considered, as the end of much extra work, and added outlay of money perhaps, he will be admonished to stick to that. It cannot be too strongly urged nor too often repeated that it is not the frequent changing of seed that is important or necessary; but, having found a variety demonstrably suitable, the cultivating of it carefully from year to year, scrupulously looking to the character of the seed. Only in this way can "running down," as the phrase goes, be prevented, and likewise the necessity of changing, so often imperative, and of resort to new experimentation for the discovery of what is best.

Some of the results of experiments with wheat, tested with reference to their respective merits, are added.

MARYLAND.—In Queen Anne, Fultz gave a much better yield than Mediterranean; grain full and plump, and lighter in color than the seed sown.

VIRGINIA.—In King George, Fultz sown quite thin, on poor land fertilized at the rate of two hundred pounds of Peruvian guano to the acre, stood the winter well, and while the Lancaster and German Amber had about equal chances, having the same fertilization, but thicker sowing, the former yielded at the rate of twenty-eight bushels to one sown, and the latter two at the rate of six to one. In Northumberland, Touzelle is pronounced too late. Fultz did not rust as badly as either Touzelle or Tappahannock. Richmond: Seven and one-fourth pounds of Fultz yielded one hundred and seventy-six pounds of good, clean wheat, or about twenty-four and one-third to one; of Touzelle, three and three-fourths pounds, yielded ninety-four pounds, or about twenty-five to one; sown after turnips; no fertilizers used. Culpeper: Touzelle, as com-

pared to Tappahannock, Fultz, Amber, and Lancaster, was about five days later, and not equal to any of them in quantity of yield or quality. New Kent: Yield of Tappahannock in good soil, sixteen to one. Sown and harvested at same time as Fultz, but the latter proved to be the better wheat. Touzelle on the same land, and sown at the same time, ripened two weeks later; yield the same, but, the experimenter says, "it is not considered safe for this climate; Fultz suits better than either of the others." A correspondent in Amelia says:

Tappahannock is grown here as a crop almost exclusively, and is thought to be the safest kind to sow one year with another, although there are varieties which, exceptionally, yield better. Fultz has a good reputation, and is anxiously sought after. A farmer who received, two years ago, a small quantity from the Department, raised ten bushels, and in the following season (1873) from the ten sown harvested one hundred and seventy-eight bushels, or nearly eighteen for one. His Tappahannock, with equal opportunities, gave him only ten to one. I realized from three pecks of Fultz eleven bushels; with no advantage over Tappahannock, which was sown side by side, its yield was almost double.

Albemarle: Two quarts each of Fultz and Tappahannock were sown in drills on a space for each of about five hundred and forty square rods, on land that had been used for a truck-patch, for which it had been well manured with stable-manure, but no fertilizers applied after removal of truck; winter severe, with alternate freezing and thawing; some of the wheat fell down, and a considerable quantity was eaten by fowls; yield of Fultz, three and a quarter bushels; of Tappahannock, two and a half bushels; or at the rate of fifty-two to one for the former and of forty to one for the latter. Fairfax: Touzelle was sown by four farmers, and was treated by each similarly, but it did not do as well as either Lancaster or Tappahannock.

NORTH CAROLINA.—Stanley: Of the varieties sown—Tappahannock, Fultz, and Touzelle—Tappahannock was the best as to yield, soundness, and weight of grain. Touzelle, after a promising growth till in bloom, rusted and failed entirely, surrounded by other varieties altogether free from rust. Montgomery: One quart of Touzelle, on average upland, yielded five gallons; one quart of Tappahannock, on similar soil, nine gallons. "In every trial made, Tappahannock proves the better wheat."

FLORIDA.—The following are given at their worth, Florida not being classed among the wheat-producing States. Madison: Touzelle, sown in December, yielded finely on hummock-land, though a severe rainy spell about the time of maturing caused considerable sprouting. Santa Rosa: Tappahannock does well. Suwannee: Touzelle and Tappahannock almost entire failures. "I do not think it 'will pay' to try wheat any more."

ALABAMA.—Calhoun: Fultz and Tappahannock treated alike. The first yielded thirty-two fold and the latter seven. Blount: Tappahannock yielded well; Touzelle worthless.

TEXAS.—Williamson: One quart of Touzelle and two quarts of Tappahannock sown on land that had been under culture twenty years and was very weedy. Wheat came up very well but was nearly smothered by weeds. Tappahannock was cut on the 4th of June, yielding fifty-seven pounds of beautiful, plump wheat; leaves slightly rusted, but no appearance of rust in the straw. Touzelle did better, and was not affected by rust; yield, thirty-two bushels, equal in quality to seed received from the Department. It ripened eight days later than Tappahannock. Upshur: One gallon Tappahannock sown October 25, harvested June 10, yielded two and a half bushels of sound and well-matured wheat.

One gallon Touzelle, sown November 10 on rather thin land, yielded two bushels; a heavy hail-storm had destroyed nearly one-third while in bloom.

ARKANSAS.—Stone: Fultz and Tappahannock yielded at about the same rate. The experiment being conducted with extraordinary care on a small scale, the rate of yield was sixty bushels per acre, while other kinds averaged not more than twenty, and were badly damaged by "spot." Pope: Fultz and Tappahannock succeed well, and both are early varieties. Touzelle did not do as well, nor return as good seed as sown. Washington: Experiments with Touzelle and Tappahannock in the vicinity of Fayetteville, by different persons: No. 1 Touzelle, on rich, light loam, sown middle of October, failed. No. 2 Touzelle, sown in black loam, last of September, failed. No. 3 Touzelle and Tappahannock, in equal quantity, sowed October 9 on gravelly soil, half upland; the former ripened July 8, and yielded twenty-two pounds; the latter, June 25, and yielded ninety-one pounds. Touzelle badly damaged by rust. No. 4 Touzelle a failure. No. 5 Touzelle and Tappahannock sown on medium upland, November 2; the first froze out, and the latter matured June 30, yielding fairly. No. 5 Tappahannock, sown October 14, on black muck soil, ripened last of June; yield fair, but damaged by rust. Flint Mediterranean yielded six bushels per acre. The wheat-crop of the season was generally a failure in the county, some fields producing as low as two bushels per acre for one sown.

TENNESSEE.—Bradley: One quart each sown of Tappahannock, Eureka, and Fultz yielded in order, respectively, sixty, one hundred and eighty, and one hundred and eighty-five pounds. The ground had been fertilized by turning in cow-peas a month before sowing. The correspondent says concerning this fertilizing process:

Cow-peas, by sowing them broadcast in May on poor land, will be equal to about twenty loads of manure per acre. In this section they far excel clover or any other crop for enriching the soil, as it takes only ten weeks for them to be ready for turning.

WEST VIRGINIA.—Braxton: A correspondent says the wheats best adapted to that part of the State are the Tappahannock and Fultz, although the Touzelle gives satisfaction.

MISSOURI.—Phelps: Fultz yielded double the quantity of Tappahannock, sown at the same time and on similar soil.

ILLINOIS.—Madison: Arnold's Hybrid, one peck, sown on good ordinary wheat-soil, well prepared, October 2, produced five bushels, weighing fifty-seven pounds per bushel; part of it was badly lodged; ripened late, (harvested July 7,) and grew too much in straw. "The season having been very favorable, I regarded the results as inferior compared to those of other varieties." Sowed three pecks of Fultz on the 5th of October, on same soil, prepared in same manner; harvested June 24; yield fifteen bushels, weighing sixty-three pounds to the bushel, and very satisfactory in every respect.

OREGON.—A correspondent in Grant County says that Touzelle is, in every particular, a success. Tappahannock is valuable on account of early maturity, but for productiveness and fine quality of flour the Touzelle is by far superior. Fultz, in Marion, yielded twenty-six bushels per acre, weighing sixty-two pounds; no better in yield than varieties usually grown. Yield in Coos, thirty-four bushels per acre.

CALIFORNIA.—In Los Angeles a farmer reports that Touzelle suffered greatly from rust. Fultz almost a failure, two quarts yielding eleven pounds, nearly all bran and no flour, on account also of

rust, "which will always attack late crops of wheat in this part of California." Of the two he thinks Touzelle the preferable wheat if sown early, say about 15th of November. When did *he* sow, in this experiment? San Diego: Yield of Fultz, fifty-nine and one-fourth bushels per acre, weighing sixty-two and a half pounds per bushel. Tulare: Fultz, sown November 2, yielded forty-eight and one-third bushels per acre. Chico: Touzelle ripens later than any other kind, and therefore ought to be sown early. Hon. John Bidwell raised about one thousand bushels in 1872, and intended to use it all for seed. Sonoma: Touzelle was sown on sandy loam where other wheats had yielded thirty to thirty-five bushels per acre. With same rate of seeding, one hundred pounds to the acre, eight quarts yielded seven hundred and fifty-six pounds, or at the rate of eighty-four bushels per acre, "pronounced by experienced farmers the finest wheat they ever saw. Millers speak highly of it."

EXPERIMENTS ON THE UNIVERSITY FARM OF WISCONSIN IN 1872.

The report of Professor Daniells was not received in time to permit the use of its valuable statements and deductions in the Department annual for 1872. Concerning the season in which these experiments were conducted, Professor Daniells says that the dry summer of 1871 and small amount of rain-fall in the autumn left the soil in poor condition to withstand the drought, which began nearly as soon as crops were planted and continued until September 22, 1872. The experiments with wheat are described as follows:

Fultz winter-wheat.—One and three-fourths bushels, weighing sixty pounds per bushel, were sown September 18 upon one acre and twenty-five rods of land. Soil was light clay loam upon which wheat had been grown the previous year, and was plowed to a depth of seven inches. The soil at the time of sowing was very dry, so that a portion of the seed did not germinate until after the rain of October 10. December 5 one-half the plat was mulched with stable-manure, upon six inches of snow. May 1 the wheat generally looked well. A few places, having each an area of 10 to 20 square feet, were entirely dead. As these places were confined to the heaviest mulched portion, the killing was attributed to too heavy mulching. Harvested July 10 to 12. Weight of straw and grain, (taken when drawn from the field,) 7,105 pounds. Weight of grain, 2,346¾ pounds. Percentage of grain to weight of straw and grain, 33. One bushel weighs 61 pounds. Yield per acre, 33.5 bushels. One pound seed yields 22½ pounds. This is a bald variety of wheat, having a stiff, strong straw, that this year was clean and bright with a slightly brownish-red color, extending below the head a few inches. The grain is light red in color, the berry short and plump. The color of the grain raised is slightly darker than that of the seed sown. Scattering heads of what appeared as two distinct bearded varieties were taken out while the grain was standing. The grain from these bearded heads was kept separate from the bald, although the yield of both varieties is included in the above results. A portion of the ground upon which this grain was grown was protected by a belt of timber upon the west side, but at no time in its growth could difference be detected between the protected and unprotected portions. The unmulched portion, although not weighed separately, was fully as good as that which was mulched. So far as one year's experience can assure the success of a new variety of grain in this climate, is the success of the Fultz winter-wheat assured for Wisconsin. By its side, and with equally favorable conditions, were sown the white winter Touzelle, red winter Soisette, and Treadwell varieties, which all winter-killed so entirely that the land was sown to other crops. The killing was doubtless done by the thawing and freezing of early spring, as the ground was well covered with snow during the winter. But the Fultz was subjected to the influences that destroyed the other varieties, and yet succeeded well. On this account I have great faith that it will prove valuable as a hardy variety of winter-wheat.

White Winter Touzelle wheat.—The seed of this variety was first furnished us by the Department of Agriculture in 1869. * * * * * * In 1869 the crop was winter-killed entirely. It was again sown in 1870, and mulched at the rate of twenty loads of

coarse litter to the acre, and yielded 23.38 bushels per acre, the grain weighing 59¾ pounds to the bushel. It was again sown in the fall of 1871, and again winter-killed entirely. We are again trying it upon a small plat, but I have little hesitation in saying that it is not sufficiently hardy to prove worthy of general cultivation in this State.

Red Winter Soisette.—The seed of this wheat was also furnished by the Department of Agriculture. It was first sown upon the university farm in 1870. The crop was that year protected by a heavy mulching and yielded twenty-two bushels per acre. It was again sown last year and killed entirely. It is a French variety, and not sufficiently hardy for our climate.

Treadwell winter-wheat.—This variety, so well known as a valuable and hardy variety in Michigan, was first sown upon the university farm in 1869, upon land partially protected by a belt of timber from the west winds. One-half of the ground was mulched. The mulched portion yielded eleven bushels per acre, the unmulched six and one-half bushels being badly winter-killed where not thoroughly protected. In our trial of this variety the past year, it again winter-killed so entirely as to show that it is not sufficiently hardy for cultivation here. In the Baraboo Valley, and in some other timbered portions of the State, these varieties might possibly prove sufficiently hardy; but for all localities where the condition of the soil and climate are similar to those of Dane County, our experience with White Winter, Touzelle, Red Winter Soisette, and Treadwell varieties for three years will warrant the statement that they are too tender to withstand the severity of our winters.

In his report of experiments for the year ending October 31, 1873, Professor Daniels says, concerning the Fultz variety, that one and one-fourth acres of new ground had been sown to it September 10, 1872, at the rate of one and one-half bushels to the acre. A large portion of the crop was on low and level ground. Seventy-five square rods were left standing; harvested July 11; weight of straw and grain, 2,396 pounds; weight of grain, 562½ pounds; weight of one bushel, 60 pounds; yield, per acre, 20 bushels. Percentage of grain to weight of straw and grain, 23.4. One pound of seed yields 13.3 pounds. It did not do as well as in the season of 1872, but still promises well, and Professor D. thinks will prove a valuable variety on account of its superior hardiness. The following varieties were in cultivation in 1873, but were entirely destroyed by the severity of the winter: A bearded variety selected from Fultz; Tappahannock; Arnold's Hybrid, No. 9; white winter Touzelle; and Diehl.

EXPERIMENTS WITH WHEAT AND FERTILIZERS.

Mr. Matthew Harrison publishes in the American Farmer the results of his experiments with several varieties of wheat during the season of 1872–'73, in Loudoun County, Virginia. The objects in view, in addition to that of testing the merits of varieties of wheat, were to test the relative merits of the several fertilizers in most common use among farmers, and the relative advantages of thin or thicker sowing. He states that several years ago he culled from among French White Chaff Mediterranean (red-bearded) a number of heads of smooth, white wheat, which seemed to be very early, and which, when rubbed out, produced six ounces. This he planted in his garden in rows one foot apart, dropping the grains separately six inches apart in the row. Product, seventy pounds. It had the appearance of Tappahannock wheat, and it was thought to be that variety in fact; but for the sake of distinction the name of Garden wheat was given to it. The result of this experiment induced him, in the season of 1871–'72, to go through the several sorts of wheat he was cultivating and cull out some of the finest heads of each. In this way small quantities of Arnold's Hybrid, Treadwell, Wickes, Diehl, French White Chaff Mediterranean, and Garden were procured. Among the Treadwell and the Wickes he found a smooth-headed wheat, like the bearded in all respects except the beards. From this Department he

procured Tappahannock and Fultz wheat. After preparing a piece of ground 273 feet long by 68¾ wide, he planted his wheat by drawing drills an inch deep, one foot apart, and dropping the grains, one at a time, in a portion of the rows at intervals of six inches, and in another portion at intervals of three inches. The planting was begun on the 1st of October and was finished on the 14th, interrupted, however, by rain for several days. The wheat was cut about the last of June, and was not weighed until perfectly dry. Arnold's and Treadwell had the advantage of being planted during the first three days. The product of Arnold's was not of good quality. The Fultz wheat, though planted last, was ripe with the first, and Mr. Harrison says, "if it had had the advantage of the earlier planting it is difficult to tell what it would not have produced."

The carefully tabulated statements of Mr. Harrison, including the prominent data bearing upon the experiment, are here appended:

Kind of wheat and number of rows, which are one foot apart.	No. of in. apart the grains are dropped in the row, one grain in a place.	Guanape—200 pounds per acre. 20 pounds guanape, 15 pounds plaster. A breadth of 16 feet. Quantity ground in square ft. and parts of a foot.	Quantity wheat in straw in lbs. and ounces.	Rate per acre of wheat in straw.	Quantity wheat thresh'd and run through the fan once or twice.	Rate per acre of wheat threshed and cleaned.	Patapsco—164 pounds to acre. 8.21 pounds Patapsco, 5.85 pounds plaster. A breadth of 8 feet. Quantity ground in sq. ft. and fractions.	Quantity wheat in straw.	Rate per acre of same.	Quantity wheat threshed and cleaned.	Rate per acre of same.	No fertilizer. A breadth of 12¾ feet. Quantity ground.	Quantity wheat in straw.	Rate per acre of same.	Quantity wheat threshed and cleaned.	Rate per acre of same.
		sq. ft.	*lbs. oz.*	*lbs.*	*lbs. oz.*	*lbs.*	*sq. ft.*	*lbs. oz.*	*lbs.*	*lbs. oz.*	*lbs.*	*sq. ft.*	*lbs. oz.*	*lbs.*	*lbs. oz.*	*lbs.*
Arnold's Hybrid, smooth red:																
10 rows	6	160	16 8	4,492	4 2¾	18.86	80	9 12	5,308	2 2	19.28	127.5	13	4,441	3 3½	18.76
27 rows	3	432	53 4	5,873	15 14	26.65	216	31 12	6,403	8 11	29.20	344.25	40	5,061	10 2	21.35
Treadwell, bearded white:																
15 rows	6	240	31 12	5,763	9 14	29.87	120	17 14¾	6,506	5 6¾	32.62	191.25	21 13¼	4,972	6 10¼	25.08
28 rows	3	448	50 12	4,935	13 9	30.08	224	25 4	4,910	9	29.17	357.	30 12	3,752	11 3	22.75
Tappahannock, smooth white:																
Not quite 2 rows	6	16	1 8	4,084	0 6¼	17.72	13	1 4	4,188	0 5¼	16.33	25.5	1 4	2,135	0 6	10.68
Diehl, smooth white:																
15 rows	6	240	13 4	2,405	4 4½	12.62	120	7 8	2,723	2 11	16.26	191.25	8 12	1,993	3 3	12.1
15 rows	3	240	17	3,086	5 9½	16.92	120	8 12	3,176	2 3	13.23	191.25	13 8	3,075	3 7½	13.17
Wickes, bearded white:																
20 rows	6	320	20 8	2,791	7	15.88	160	11 4	3,063	3 12½	17.16	255.	19	3,246	6 8	18.50
20 rows	3	320	30 12	4,186	12 4	27.79	160	20	5,445	7	40.84	255.	23 8	4,014	8 7	24.
Wickes, smooth:																
2 rows	6	32	2 8	3,403	0 12	16.85	16	2 4	6,126	0 9¾	31.48	25.5	3 8	5,979	0 11	19.57
French White Chaff Med'n:																
20 rows	6	320	26	3,539	9 8	21.55	160	16 4	4,424	5 10½	25.67	255.	22 12	3,886	8 9	24.38
26 rows	3	416	36 12	3,848	13 13	26.10	208	23	4,817	8 8½	29.78	331.5	29	3,811	9 14½	21.70
Treadwell, smooth:																
12 rows	6	192	17	3,857	5 10	21.27	96	11 11	5,303	2 12	20.8	153.	8	2,278	1 12	8.3
Garden, smooth white:																
20 rows	6	320	25 1	3,412	8 3½	18.65	160	11 2	3,029	3 9	16.16	255.	11 14	2,028	3 6½	9.70
20 rows	3	320	33 2	4,500	11	24.96	160	15 14	4,322	4 15½	22.55	255.	21 12	3,705	6 14½	19.8
Fultz, smooth red:																
10 rows	6	160	17 12	4,832	6 14	31.20	80	10 8	5,717	3 7	31.20	127.5	13 10	4,655	3 11½	21.18
11 rows	3	176	23	5,693	7 2	20.89	88	15 2	7,487	4 8¼	37.38	140.25	19 15	6,192	6 2	31.7
4 parts of rows	3	......	......	......	......	......	16	1 9	4,254	0 7½	20.56	25.5	3 8	5,979	1 2¼	32.92
		4,352	421 7	4,218	140 14½	23.51	2,197	240 12¾	4,779	55 11½	25.02	3,506.25	305 8¼	3,796	95 5½	20.69

Kind of wheat and number of rows, which are one foot apart.	No. of in. apart the grains are dropped in the rows, one grain in a place.	Patapsco—164 pounds to acre. 16.43 pounds Patapsco, 11.76 pounds plaster. A breadth of 16 feet.					Excelsior—419 pounds to acre. 42 pounds Excelsior, 30 pounds plaster. A breadth of 16 feet.					Summary. A breadth of 68¾ feet.				
		Quantity ground.	Quantity wheat in straw.	Rate per acre of same.	Quantity wheat threshed and cleaned.	Rate per acre of same.	Quantity ground.	Quantity wheat in straw.	Rate per acre of same.	Quantity wheat threshed and cleaned.	Rate per acre of same.	Quantity ground.	Quantity wheat in straw.	Rate per acre of same.	Quantity wheat threshed and cleaned.	Rate per acre of same.
		sq. ft.	*lbs. oz.*	*lbs.*	*lbs. oz.*	*lbs.*	*sq. ft.*	*lbs. oz.*	*lbs.*	*lbs. oz.*	*lbs.*	*sq. ft.*	*lbs. oz.*	*lbs.*	*lbs. oz.*	*lbs.*
Arnold's Hybrid, smooth red:																
10 rows	6	160	20 8	5,581	4 10	20.99	160	18 4	4,968	4 10½	21.13	687.5	78	4,796½	18 12½	18.93
27 rows	3	432	44 12	4,512	12 6	20.80	432	30 8	3,075	9 8	15.96	1,856.25	166 2	4,382½	56 9	22.12
Treadwell, bearded white:																
15 rows	6	240	21 12	3,948	6 9	19.92	240	16 12	3,040	5 3½	15.78	1,031.25	110	4,646.4	33 11½	23.72
28 rows	3	448	45 8	4,424	13 13	22.38	448	41 4	4,011	15 1	24.61	1,925	193 8	4,332	67 10	25.68
Tappahannock, smooth white:																
Not quite 2 rows	6	32	1 8	2,042	6¼	9.57	32	1 8	2,042	8¼	10.53	118.5	7	2,573	2 0½	12.47
Diehl, smooth white:																
15 rows	6	240	14 8	2,632	4 6	13.33	240	13	2,360	4 4½	12.62	1,031.25	57	2,409	18 13	13.28
15 rows	3	240	29 12	5,400	8 10½	26.19	240	18 8	3,358	6 4½	19	1,031.25	87 8	3,696	26 3	18.44
Wickes, bearded white:																
20 rows	6	320	31 4	4,254	9 6	21.27	320	23 8	3,199	8 2½	18.5	1,375	105 8	3,338	34 13	18.38
20 rows	3	320	32 12	4,458	10 12	21.39	320	30 4	4,118	9 11½	22.05	1,375	137 4	4,348	48 2½	24.20
Wickes, smooth:																
2 rows	6	32	2 8	3,403	10½	14.9	32	1 12	2,382	7¼	10.28	137.5	12 8	3,690	3 2½	16.07
French White Chaff Med'n:																
20 rows	6	320	30	4,084	10 10	26.10	320	28 8	3,880	9 0½	20.49	1,375	123 8	3,912	43 6	22.90
26 rows	3	416	41 12	4,372	13 14	24.11	416	37 12	3,953	12 2½	19.40	1,787.5	168 4	4,100	58 4½	23.67
Treadwell, smooth:																
12 rows	6	192	13 8	3,063	2 14	10.69	192	8 1	1,829	1 6	5.2	825	53 4	3,076	14 6	12.65
Garden, smooth white:																
20 rows	6	320	23 8	3,199	7 6½	16.79	320	23	3,131	8	18.16	1,375	94 9	2,996	30 9½	16.15
20 rows	3	320	29	3,947	9 5	21.13	320	32 2	4,373	11 13	26.8	1,375	131 14	4,178	44	23.22
Fultz, smooth red:																
10 rows	6	160	17 4	4,696	5 4½	23.96	160	16 3	4,407	4 10½	21.05	687.5	75 5	4,772	23 15½	25.31
11 rows	3	176	24 11	6,110	7 4½	30	176	24 12	6,126	7 8	30.94	756.25	107 8	6,192	32 9	31.26
4 parts of rows	3	48	6	5,445	2 0½	30.72	64	10	6,806	3 3½	36.35	153.5	22 1	6,261	6 13½	32.37
		4,416	430 7	4,246	130 4½	21.42	4,432	375 10	3,692	121 9½	19.92	18,903.25	1,755 11	4,046	563 13½	21.65

Experiments on the eastern farm of Pennsylvania Agricultural College.—The superintendent of this farm, which is located in Chester County, makes the following report of experiments with sixteen varieties during the season of 1872–'73. Varieties distributed by the Department are indicated by an asterisk [*.]

The ground used was an oat-stubble, with a coat of barn-yard manure plowed under and surface application of dissolved-bone and ashes compost, put on at the rate of four hundred pounds of dissolved bone and eight bushels of tan-ashes per acre, harrowed in.

The seed was sown broadcast, at the rate of two bushels per acre, on the 20th of September, 1872, and the wheat cut from July 9 to 14, and thrashed July 15 to 20.

The wheat was weighed when run through the fan once, and not entirely clean, but as the rakings of the plots were not included in the weights the results would not be seriously altered by the second cleaning. The plots contained one-eighth of an acre, with a space of two feet between them:

No.	Kind.	Color of grain.	Smooth or bearded.	When ripe.	Pounds of straw.	Pounds of grain.
1	Lancaster Red	Red	Bearded	July 10	370	230
2	Rough and Ready	Red	Both	10	521	271
3	Brittany	Red	Bearded	10	300	220
4	Roger's	Amber	Smooth	14	485	261
5	Week's White	White	Bearded	9	347¼	216¾
6	Touzelle*	White	Bearded	14	442	213
7	Fultz*	Red	Smooth	9	503½	282½
8	Jenning's*	White	Bearded	9	454¾	223¼
9	Shoemaker	Red	Smooth	12	461¾	228¼
10	Tappahannock*	White	Smooth	9	276¾	147¼
11	Arnold's No. 9*	White	Smooth	10	441½	204¼
12	Kansas	Red	Bearded	11	399¾	220½
13	Dot or Paducah	Red	Bearded	9	437	226½
14	Lancaster Early	Red	Bearded	11	426	240
15	Way	Red	Bearded	11	430	260
16	Old White C. M.	Red	Bearded	11	400	225

It will be observed in this exhibit that Fultz yielded among the sixteen varieties the largest amount of grain, and, with the exception of Rough and Ready, the largest amount of straw. The superintendent, after the experimentation of two seasons with varieties of wheat, suggests to farmers to try the Fultz wheat enough to show its suitability to their soil and circumstances. He speaks of the Rogers as a fine wheat, not so productive or early as the Fultz, but a better quality of wheat, and would do well on strong ground or with high manuring.

CORN.

In 1872 the Department distributed two varieties of corn, the Cooley, (white,) which originated on the farm of Mr. Cooley, on Manchester Island, Ohio, and the Pennsylvania Yellow, cultivated successfully for several years in Eastern Pennsylvania. A large number of experiments with both was published in the annual report for 1872, the character of which led to a further but modified distribution for the planting season of the current year. While the Pennsylvania corn succeeded well as a new variety in the States of the Northwest, and measurably in some of the Eastern, it gave more especial satisfaction at the South, on account of earliness, largeness of yield, and excellence both as food and fodder. The Cooley does not prove suitable to the more exacting climates of the East and Northwest, and in the South is considered an acquisition chiefly on account of rapidity in maturity and its desirability for table use. As a stock or forage corn it has not shown particular fitness.

Experiments in 1873, with both varieties, are here added.

COOLEY.—*Northwestern States.*—Illinois: Henderson, valuable only

on account of early maturity. Planted May 10, was dry enough to grind by 1st of September. Mercer, yield small, compared with that of other kinds. Wisconsin: On the farm of the State University the yield per acre was sixteen bushels of ears, seventy-five pounds per bushel; ripened one week later than Blue Australian cultivated adjacent. "This corn might yield better when the drought is less severe, but it had with us this year none of the characteristics of an early variety." Minnesota: Dakota, not as good a variety as the large yellow Dent, which, although planted ten days later, was fit to cut up when the Cooley was in roasting-ears. Rice, planted May 22 on rich, well-manured, sandy loam, and cultivated in the best manner, it yielded at the rate of sixty bushels of shelled corn per acre, ripening, fit for use, in one hundred and eight days, but not as early as several kinds raised at same time; yield not equal to Sanford corn raised on the same field with the same cultivation. Iowa: Buchanan, two weeks later than common corn; growth of stalks good, but cobs too large for depth of kernel. Nebraska: Otoe, not much earlier than other varieties.

Southern States.—Virginia: Frederick, planted April 20, matured early in September. Yields better, growth much quicker than those of other varieties. Rockbridge, matures earlier than common corn, but yield about the same. A farmer in Henrico County planted the larger grains in rich land. It was thoroughly ripe by the 20th of August, and dry enough to grind. He regards it as the best corn he has seen for general farm purposes, and, after an experiment of selecting the larger grains for planting, is satisfied that the corn might become, in time, of fine size, and the number of ears be greatly increased. North Carolina: Wake, that planted in light soil, with heavy red subsoil, succeeded best, coming up promptly, and growing well in spite of the drought. South Carolina: Barnwell, early maturity secures it from June and July drought; ripens about as early as sugar-corn, and might be made valuable for field culture. On the other hand, another correspondent says it signally failed on account of frost and hail, and does not think it is suited to the climate as an early field-corn. From Georgia, Florida, Alabama, and Mississippi favorable accounts have been recorded concerning early maturity and escape from the usual ill effects of drought. Louisiana: Madison, planted March 14 at the rate of one gallon per acre; harvested October 23 at the rate of eighty-four bushels per acre, weighing fifty-seven pounds per bushel. Texas: Ripened in thirteen weeks; all the ears, large and small, sound; yield at rate of eighty-five bushels per acre.

PENNSYLVANIA YELLOW.—*Northwestern States.*—Illinois: Saint Clair, planted April 22 on rich black loam; it fully matured in one hundred days at the rate of sixty bushels per acre, and before chinch-bugs could do it any harm. Michigan: Oakland, Cooley and Yellow planted same day, May 17; latter fit to cut September 1 and former on 13th; its fodder inferior to the P. Yellow. Grand Blanc, yield one hundred bushels per acre; requires a longer season than the common varieties. Dane, too late; stalks large and ears small. Iowa: Pottawattamie, not as good as common corn. Kansas: Miami, fifty-two and one-third bushels per acre; quality about the same as Yellow Dent, but ripened three weeks earlier. Riley, planted on land broken a year before; yielded fifty-five bushels per acre. Nebraska: Cass, third crop often breaking; rather below the average in all respects.

Southern States.—Virginia: Prince George, yield equal to that of common varieties, and matures earlier. North Carolina: Last year Mr.

R. A. Patterson, of Halifax County, wrote that this corn was three weeks earlier than any other, but that a white variety usually planted had a smaller cob, with deeper grain, and shelled much more per ear of the same length than the yellow. This year field-corn does not produce as well the first year, if of northern origin, as in subsequent seasons. Bolivar, "I have every reason to believe that this variety will prove an excellent field-corn." Louisiana: Caddo, planted, March 1, on sandy loam; harvested July 20. Compared with other varieties, yield favorable; quality no better; growth much quicker, and in ordinary years would escape drought. Carroll, does better than Cooley, ripening three weeks earlier than any other, and is very prolific. Texas: Robertson, a month earlier than the common corn; yield about the same. Arkansas: Reports from five counties show that it is from two to four weeks earlier than other varieties; grain heavy, and ears, in some cases, twelve inches in length. Tennessee: Coffee, fully as strong in growth as the Missouri Yellow; planted side by side and one week earlier; stalks six to seven inches high and one inch in diameter. Giles, planted on the same soil, same day, with the common varieties; was fit for roasting when they were tasseling. Missouri: Lawrence, valuable for both early and late sowing. Planted April 5, was in roasting-ear July 20, two weeks earlier than common field-corn. A Twiggs County correspondent says: "The Pennsylvania Yellow corn received from the Department was planted in March, manured with cotton-seed. While my other corn, planted a week earlier, is just tasseling, (July,) the Yellow is *made*. I planted Adams' Early Sweet corn and three other varieties, Sugar, Flint, and Cooley, but the Yellow is much superior to any of the others." Florida: Madison, matures earlier than other varieties, being hard enough for mill-corn by the time the latter are in roasting-ear. "It enables farmers to have corn, food, and fodder a month to six weeks earlier than if common field-corn were depended on." Leon, ears as large as those of southern corn, and two weeks earlier. Alabama: Bullock, for stock, the best planted, on account of early maturity. Jefferson, planted March 15, was in roasting-ear June 28. Tried two seasons in Geneva; "is four weeks earlier than the common varieties; in fact, we can easily make two good crops a year. White corn does well, but is not as forward as this variety; the stalks do not grow as tall and large as the common kinds, but the ears are fine, large, and heavy." Mississippi: A county correspondent states that in this climate, after fair trials two successive seasons, the Yellow proved a failure; that the quality of the grain seemed to deteriorate, becoming shallow, and the ear, consequently, light. It was planted on rich alluvial bottom, and also on good highland by the side of the common white corn; but it proved far inferior to the white except that it matured about three weeks earlier. South Carolina: Barnwell, planted late in March, it matured by July 15; very prolific and ears well filled and of good size, measuring in length from nine to thirteen inches; "the material advantage is, that it is about a month earlier than other corn, maturing before the hot, dry season, and thus supplying the crib at a time of scarcity." Lexington, yield about equal to that of the other varieties, but two weeks earlier. Georgia: Liberty, planted on light land, it matured earlier than common varieties, and escaped the severe drought of June and July. Walton, produces a small stalk, but an average ear, and is very early in maturing. It will admit being crowded in the drill, and, with a fair season, should produce a much larger yield per acre than varieties of larger stalk.

OATS.

The Department has, since its organization, introduced from Europe several varieties and subvarieties of oats, which have become well established in those parts of the country where the cereals most flourish. Among these may be more particularly mentioned the New Brunswick from Scotland, the Excelsior and the Somerset from England, and the White Schönen from Germany. Although reports concerning these severally are still received in considerable number, it is not considered necessary to specially note them, since, taken all together, they are about the same in general tenor as those heretofore published in the annual reports of the Department. During the year current, White Schönen oats have been distributed; also, Fellow, (or Yellow,) Hopetown, and Potato oats. The last-named is not unknown on account of former distributions; but the tests made had not been fully satisfactory as to the character of the variety or its suitableness for more general distribution. The Hopetown and Yellow oats were introduced for the first time in the spring of the present year, the former imported from Canada the latter from Scotland. The accounts received from them are not, therefore, numerous, but such as are considered significant, for or against, are succinctly given.

Loudon refers (section 5127) to the Potato oat as belonging to the class of very distinctly marked varieties. He describes it as large, plump, rather thick-skinned, and white in grains, double and treble, with very long straw, and speaks of it as almost the only oat then raised on land in a good state of cultivation in the north of England and south of Scotland, usually commanding a higher price in the London market than any other variety. It was discovered growing in a field of potatoes in Cumberland in 1788; and from the produce of the single stalk which there sprung up by accident, probably from the manure, was produced the stock in general cultivation.

Concerning the origin of Hopetown oats it is said that in 1824 a stalk was observed in a field of Potato oats at Mungoswells, county of Haddington, Scotland, which was unlike others surrounding it. The grains were gathered and sown in the following spring. The stalks from this planting were conspicuous for height, and the oats were of excellent quality. They were subsequently cultivated with success in Canada. On rich soils the product is superior. The Fellow is a variety well known and popular in Scotland, where it is distinguished especially for earliness of maturity.

FELLOW, (YELLOW.)—In Berks, Pennsylvania, although sown very late, gave a fair yield, and proved superior in straw to other kinds. In Marshall, Indiana, although the season was particularly unfavorable, the Fellow oat grew two and a half to three feet high, and two quarts sown yielded eighteen; ripened two weeks later than other oats; headed well, about one-fourth stooling out, something unknown among the common varieties. In Adams, Ohio, about a week later in ripening than other oats; straw three and a half to four feet in height; weight, forty pounds per bushel. Writing from Harrison County, West Virginia, a correspondent says they seem to be about as good as the White Schönen; the straw is large and tall, and grain heavy. Maryland: Somerset, four quarts were sown on one-twelfth of an acre; ripened several days before the rest of the oat-crop; stood up well; large straw, long heads; yield, one hundred and forty-four quarts, weighing thirty-six pounds per bushel. "Had not a drought of uncommon severity prevailed for several weeks before they were cut, I think they would have made more and heavier grain." Caroline,

made a better stand than the common and filled well. In Baltimore County, where the general oat-crop was reducedby a protracted drought, the Fellow oats are reported as having done well.

HOPETOWN.—In Renville, Minnesota, the yield was fifty bushels per acre; grain plump; straw stiff and stands up well. Virginia: Bland, two quarts were sown, March 20, on poor, stony soil, and received no extra attention; in height averaged four and a half feet; straw large, stout, and beautifully headed; cut July 25; yield, two bushels and one-half gallon, or thirty-three-fold; weight, forty pounds per bushel. North Carolina: Orange, four quarts sown broadcast in April, at the rate of one bushel per acre, yielded a little over two bushels, weighing thirty-six pounds per bushel. Growth vigorous, straw very tall and stout, heads long, and grain short, plump, and heavy. In Polk County, Georgia, the yield was good and the grain fine and large. In Jefferson County, Alabama, sown March 1, on poor, red land, well manured; grew well; ripened middle of June; height four feet; crop heavy and clear of rust. A Los Angeles County (California) correspondent says: "The Hopetown oats turn out a 'brilliant success.' From two quarts there was a yield of one hundred and fifteen pounds of good, plump grain. I do not like the variety for its straw, as it grows too rank and coarse; some grew as high as six feet, with stalks one-half inch thick."

POTATO.—Indiana: Succeeded fairly in the counties of Orange and Harrison. Wisconsin: Professor Daniells says, concerning an experiment on the University farm:

The Potato oats have never done well with us, and this year were wholly ruined by the dry weather. In my opinion they have been fairly tested, and are not worthy of further cultivation.

Mr. E. W. Sherman, of Franklin County, Vermont, says:

I sowed one quart on the 13th of May on about three square rods, on which corn had been raised the year before, with no other fertilizer than the farm-manure that had been put on in that year to put the land in good condition for corn. They were reaped and stooked in the field September 1, having been on the ground; taken in September 10 in fine condition, thrashed, and yielded about thirty-six quarts, weighing thirty-eight pounds. Oats beautiful and bright, the finest I ever saw. My farm is about nine miles south of the Canada line, at an elevation of about 900 feet above tide-water.

Kansas: Reports from three counties give average yields; grain good but somewhat later in maturing than the common black oat.

Southern States.—Virginia: Wythe, one bushel yielded twenty-five; time of ripening too late, ten days behind White Schönen. King William, sown side by side with Siberian, (of which the yield was very large;) was scarcely worth cuttting; lodged badly. Goochland, four quarts seeded on fair land, similar in quality to that on which native spring-oats were sown; crop inferior; irregular in heading, and much later in maturing than the native. In Rappahannock, unpromising. Northumberland, stalks very large; a week later than the common varieties. North Carolina: Madison, did not succeed on good tobacco-land, red soil; White Schönen considered the best in the county, (Granville.) Late but of good quality. South Carolina: Grew vigorously, matured early, but lodged without exception. Georgia: Wilkes, sown middle of March, cut July 1; straw not very heavy, but no rust; has characteristics of rust-proof varieties. Reports from four other counties give fair yields. Alabama: Blount, Four quarts yielded four bushels. Mississippi: Clarke, stalks large and strong; heads of good length and well filled; yield about twenty bushels to the acre; sown on unmanured, flat pine-wood land. Louisiana: Stalks grew very tall and yielded satisfactorily in favorable season. Texas: Sown in April they escaped

grasshopper ravages and returned grain of excellent quality. Tennessee: Straw larger than that of the common varieties. Arkansas: Yield not as heavy as that of the common kinds. Missouri: Far superior to any variety yet introduced in the county.

BUCKWHEAT.

SILVER-HULLED.—This is a variety of German origin, imported a number of years ago, and tested with favorable results in the experimental gardens of the Department in 1865. It was, however, first distributed to any extent in 1871, and the reports coming from that distribution indicate that the new variety is superior in several respects to those now generally cultivated.

Experiments in Illinois show good yields of heavy, plump grains, maturing much earlier than common varieties. Four counties in Ohio give also fine yields, in one instance doubling the old varieties. Quality of flour, superior. In Michigan two quarts yielded four bushels. A farmer in Illnois did not raise as much on rich land as on poorer. Not all those who wish to raise good crops of buckwheat remember that it thrives well on the commoner soils, drawing a large portion of nutriment from the atmosphere on account of its abundance of leaves. Professor Daniells, of Wisconsin, states his experiment as follows:

> Eight quarts of seed, weighing 13 pounds, were sown June 28, upon 72 square rods of ground. The growth was very slow on account of dry weather. Harvested September 30, not fully ripe. Weight of grain, 526¼ pounds. Yield per acre, 27¾ bushels. One bushel weighs 46½ pounds. The yield would have been larger had it been fully ripe. It was necessary to harvest the grain when we did to prevent killing by frost. The quality of the flour, or the amount that a bushel of the grain yields, has not been tested.

The drawbacks considered, the rated yield was a very good one, when it is remembered that the estimated average yield per acre for the entire State in 1872 was 17.5 bushels, and the average in the United States 18.1 bushels per acre.

In Iowa seven pounds yielded thirty-five bushels of superior grain—weight considerably greater than common. In Nemaha, Kansas, sown July 6, harvested October 9, yielded twenty-four bushels per acre, weighing fifty-two pounds per bushel—superior in all respects to other varieties; Bourbon, stood the dry weather well; yielded better and ripened two weeks earlier than the common variety.

A farmer of Watauga County, North Carolina, says that this variety comes to perfection in so much shorter time than the old that it must prove very valuable to that part of the State where a large portion of the population depends on buckwheat, rye, and other cereals belonging to the high, cold latitudes. In Caswell County, notwithstanding very late sowing, an unpropitious season, and attack of chinch-bugs, four quarts yielded one hundred. A South Carolina correspondent is satisfied that in that climate this buckwheat may be sown advantageously for pasturage, and that an ordinary season would mature the grain before frost. In Lumpkin, Georgia, when sown July 4, it fell and was rotted by the first frost. A Mississippi farmer is convinced that the grain can be grown in that State if planted about the middle of September, and an experimenter in Louisiana is of the opinion that it ought not to be sown before the middle or last of August, the hot, dry seasons of summer endangering its growth. In Greene, Tennessee, sown late in July, the yield was twice as great as that of the ordinary kind.

This buckwheat finds a good home on the Pacific coast as shown by reports from California and Oregon. A correspondent writing from the

latter State in August says: "From the product of two quarts sown in 1872 I have now two acres in full bloom, as fine a field of buckwheat as I ever saw."

GRASSES.

A journalist of the Southern States truthfully observes, that "there is no one item in our present and past system of farm economy that requires a more radical change than that of grass-culture. The South is covered all over with old fields and brier patches, that *once* were under successful and profitable tillage, but which now, from the scarcity and unreliability of labor, the proprietors find it impossible to cultivate in any of the ordinary farm-crops of the South." To meet this want, by introducing into various parts of the South seeds of varieties considered adaptive, has been an endeavor of the Department. Last year were distributed the *Bromus Schraderi*, an annual, well adapted to foddering, the Italian rye-grass, (*Lolium perenne*, var. *Italicum*,) and alfalfa, (*Medicago sativa;*) also, to a limited extent, red clover and blue-grass. The distribution was continued this year, and included other varieties. That alfalfa, known also as Lucerne and as Chili clover, would well answer the purposes of the South, admits of no doubt. Before the late war effort was made to introduce it, and in many cases with marked success. The writer quoted above cordially and emphatically indorses all that has been or can be said in favor of this grass as a soiling and hay-producing plant for the South. More attention has been given in California to the cultivation of alfalfa than anywhere else in this country, and from that source, therefore, we are indebted for many suggestions as to its habits and the best methods of treating it. We add some references to Alfalfa, drawn from current sources, making them as brief as possible.

Alabama.—Although on new, clean land alfalfa does very well broadcast, experience demonstrates that under all circumstances it does a great deal better in drills. Until two years old it is rather a slow grower, and needs the assistance of occasional cultivation to bring it forward successfully in its contest with Crab-grass and dry weather. In broadcast seeding this assistance is, of course, out of the question. In drills, from eighteen inches to two feet apart, it is easily practicable. When *once* a good stand is secured it will, in most instances, take care of itself, and will not require reseeding for several years—perhaps five or six. The land should be deep and rich and plentifully supplied with lime.

California.—The roots are not of the fibrous and woody nature of the other grasses. Hogs feed upon them with the greatest avidity, and often follow them down to the depth of two feet or more, although this by no means destroys their vitality. Its peculiar home seems to be in a warm, dry climate, where the ground never freezes, and frosts rarely, if ever, occur. It does best in a well-drained and friable alluvial soil, with a penetrable subsoil of an argillaceous nature. In this climate it may be mown six times, or oftener, each year, and be depastured during the winter, or for a period of three months. When young it is extremely delicate, and should be sown in connection with barley or wheat. When this is removed it will generally be found to have attained the height of two inches, and thereafter the surface requires to be kept moist by irrigation, as the roots have little penetration, and the young plants would otherwise soon wither on exposure to the sun. The second year it is able to take care of itself, and the fourth it arrives at full bearing. The roots then ramify so widely and reach to such a depth that it is able to bid defiance to drought. It does not begin to fail in productiveness in less than five years. When this occurs it may often be restored to its

original vitality by plowing and thoroughly pulverizing of the surface; the portion of the roots remaining below the reach of the plow will put forth fresh shoots and the field be soon again carpeted with verdure. When this grass is generally cultivated in the warmer climates, the northern and more temperate regions of this continent will lose their present reputed superiority in stock-raising. They have hitherto retained it because no species of grass known would retain its vitality during the long hot summers of the semi-tropical and tropical climates. Alfalfa has this desirable peculiarity, joined to more than twice the productiveness of any northern grass.

The freshet of last winter cut away the bank of a creek, exposing a section of an alfalfa-field. The roots of the plant had penetrated to a depth of from 12 to 20 feet, and were exposed by the washing away of the bank from the surface to the water-line. The diameter of the root at the crown on the surface varies from an eighth to half an inch. They taper gradually to the lower end, from which a cluster of roots or feeders put out. In the section exposed the roots were close together, but entirely disconnected, each one growing straight through the soil to the water, and producing on the surface a luxuriant branch of alfalfa, which keeps green the year round. A farmer near San José sowed three and a half acres with alfalfa in February, and in September it was producing feed enough to sustain six milch-cows. Up to that time it had been cut twice. He thinks that ten cows may be supported when the grass has become fully established. A gentleman who has noted the cultivation of this plant in California for twenty years has in no instance seen it succeed without irrigation except upon alluvial soils, such as are found in the low flats along the margins of rivers. The conditions of successful cultivation are a friable, mellow, moist soil, easily penetrated by the long tap-roots, which should find a permanent supply of water at a depth of not more than six to eight, and not less than three feet; the land should be thoroughly plowed and the surface-crust well pulverized, and about fifteen pounds of clean seed sown per acre and brushed in, but not covered too deep. The sowing should be just before a rain-fall.

Nevada.—The soil and climate of Nevada seem to be particularly adapted to this plant. The subsoil is well drained, and every acre of sage-brush land that can be irrigated after the alfalfa has become established, say two or three years old, will produce from two to four times as much hay as the best bottom-lands. The sage-brush land is rich in mineral plant-food, in consequence of there not being rain enough to wash it out of the soil and carry it away to the sea. A soil which seems to be destitute of vegetable matter will, when sown with alfalfa, in a few years, be converted into a rich, black loam, filled with vegetable mold. The soil on land which is sown to grain is sometimes blown away to the depth to which it is plowed, while land which is laid down to alfalfa is constantly catching and retaining it. In one instance a piece of land which was once rough and rocky was sown with alfalfa; now the rough places are smooth and the rocks are covered up with a fine, black loam.

It is hoped that the trials of this valuable plant now being made, and those which will be undertaken during the season of 1873–'74 in the Southern States, will afford particulars both of interest and profit for the report following the present one.

GUINEA GRASS.—The Department procured from Jamaica, West Indies, a supply of seeds of this grass as commonly known, and distributed it in the fall of this year. Hon. Thomas Pearne, United States consul at Kingston, through whose agency the seed was purchased,

says in regard to it, that of the two kinds of grasses grown on the island almost exclusively (Bermuda and Guinea) the Guinea is cultivated the more extensively. It grows tall and rank, reaching the height of eight or ten feet, when mature, and yields a coarse seed, very much resembling millet. It grows anywhere on the island, up to the top of the highest mountains, growing rankest where the rain-fall is most abundant. In Saint Mary's Parish, which has more rain than any other, it is coarser than when grown in other parts. It grows in bunches, like the buffalo-grass of the western plains. It is cultivated by "sets," and from the seed. A few bunches set out in a field will soon thickly cover the whole, growing very rapidly. Horses, cattle, sheep, goats, and hogs fatten well upon it.

In the report of the Patent-Office on agriculture, for 1849, this grass was referred to by a farmer of Hempstead County, Arkansas, as follows:

All the varieties of meadow-grasses that are so much esteemed in a more northern latitude have nearly failed here by reason of the long-continued droughts and the heat of our summers. To obtain a grass suited to our wants has long been a desideratum, and I believe from an experience of seven years that it has at last been discovered. This is the *Guinea grass*. It is a native of Africa, and was first imported into the island of Jamaica by the governor, as a bird-seed. It was there propagated, and has become a very important article of provender and pasture for every kind of stock, considered second only in value to the sugar-cane. It was introduced two years ago into Louisiana, where it is highly valued for soiling and for hay. On rich, dry ground it grows to the height of eight feet, and may be cut when four feet high four times in a season, yielding two tons per acre at each cutting. I consider it equal to the best cured corn-blades of equal weight. It is best propagated by the roots, which resemble those of the *calamus*—each joint sending up a tuft of blades. The roots extend deep and wide, occupying all the ground as deep as the soil is loosened, and are equal to artichokes as food for hogs.

Concerning the origin of the grass, Mr. Pearne gives the same account.

Lorin Blodgett, in the Agricultural Report for 1853, (article Climatology,) says:

Agriculturists at the South have scarcely been successful in the attention hitherto given to the valuable grasses. There cultivation is less a necessity of plantation management than of farm occupation, as at the North, and it only becomes imperatively such when the preservation of the soil from washing and exhaustion becomes necessary. Such is, at present, the state of much of the cultivated area at the South, and it is of the first importance to know whether the permanent grass covering of the soil may be attained by any possible means.

The normal range of the grasses, strictly speaking, is not so far south. Their native climates are north of the native grain districts, and in cooler and more humid atmospheres, while the southern part of the United States has a tropical summer, and lies on the opposite side of the climatological limit. We cannot anticipate success in grasses taken from the colder extreme in this opposite position, and probably very little for those adapted to dry climates, whether warm or cold. The source should be tropical; and such has, indeed, been the origin of many species introduced and cultivated to some extent at the South. The Guinea grass (*Holcus polygamum*) is of this sort, and the Bermuda grass, (*Digitaris dactylon.*)

Flint, in his work on grasses, adopts these and other paragraphs of the same import, only substituting other botanical names, designating Guinea grass as *Sorghum vulgare*, and Bermuda as *Cynodon dactylon*.

In Chambers' Encyclopedia this grass, as *Panicum maximum*, and of the same genus with millet, is described as a native of the west of Africa, but now naturalized and extensively cultivated in the West Indies and Southern States of America. "It does not perish even in the winters of Britain, but is not luxuriant and productive, as in warmer climates. Its height, in favorable moist situations, is from five to ten feet; in dry grounds, it is smaller; it has a much-branched and spreading panicle, long flat leaves, and a somewhat creeping root. In countries favorable to its growth, it is very valuable as food for cattle. Other

species of the same genus are among the most useful pasture and forage grasses of tropical countries."

A correspondent of the Southern (Georgia) Cultivator, writing from Alabama, August, 1873, relates that he had just visited a plantation on which the Guinea grass (known there as the Johnson) had been growing for twenty-five years. It had been looked upon as a *curse* upon the plantation, and one that could not be got rid of. A trial of it was made by livery men of a neighboring town in their stables. After feeding it a month these gentlemen were satisfied as to its superiority for their purposes over any hay they had yet been able to get. "One stable alone agreed to take all brought in, if it were five hundred bales, asserting that it was not only the very best hay, but acted finely upon the bowels, keeping them in a much healthier condition than the ordinary hay; it sold readily at $30 per ton." As to its characteristics, he says that the grass comes up in the spring both from seed and root, and by the middle of April there is a fine pasture, which cattle and horses feed upon with greediness. On good slough-lands by the middle of May generally a ton per acre can be got, and one ton a month up to the time of frost—averaging from five to six tons during a season. In the case of the plantation referred to, the planter, with the assistance of two hands, made $200 during the interim from fodder-pulling till cotton-picking season. "Though the grass 'dies down' in the winter, cattle and sheep do finely on it; far down under the *débris* of summer growth it remains tender and sweet all winter, and you often find a cow buried to the shoulders hunting it."

The editor of the Cultivator, referring to this, calls the grass *Sorghum halapense*, and says that his own experience confirms the observations of the correspondent. Quoting the paragraph:

It is certainly a *pest* in the same sense as Bermuda grass, possessing, like the latter, underground stems by which it is rapidly scattered if the land is plowed, and from which stems spring up above ground very rapidly when the previous growth is cut down. It comes up very early in the season, and if cut down continues to shoot up through the summer with great rapidity. A few years ago we thought it valueless for stock-feed, our horses seeming not to relish it, but we have since discovered that *if cut before the stems are fully formed*, or rather just as the latter begin to shoot up, stock relish it very much, and, judging from the condition of those fed upon it, the grass must be quite as nutritious as other grasses. For summer soiling we can therefore recommend it—for grazing purposes we have no experience.

As reported to the Department during the present year, Guinea grass is the only grazing or hay grass used in Bibb County, Alabama, where, with four cuttings, it yields four tons per acre, and is very much relished by horses and cattle.

In several of the more recent numbers of the monthly reports of this Department statements of correspondents and others concerning this grass were published. To some of these it may not be inappropriate again to refer in this article.

Mr. C. Coddrington, of Florida, formerly of Jamaica, says:

On coming to Florida, I perceived at once that the great want of the State was a good grass to suit the climate. I wrote to Jamaica for some seeds of the hardiest variety, called there the "Saint Mary's grass." This I planted in the spring of 1872, and got about twelve plants to grow. As fast as the roots got sufficiently large, I took them up, separated them, and replanted, some roots giving me twenty-five to thirty plants; but I found that the planting should be done immediately after a heavy rain, when the earth is quite wet. I continued this operation until September, when I allowed the plants to go to seed. Part of the seed I gathered, and left some to drop. The plant stood several severe frosts before the grass was killed. I then cut it off and found stock even then ate it with avidity. This spring the old roots sprouted again, and all around them innumerable young plants came up from the seed that had been sown the last autumn. I continued the same system the summer following (1873) that

I did with my plants in 1872, with perfect success. Others who procured plants from me, and have followed directions, have also succeeded, and it now only requires enterprise to make this State the grazing State of the Union, for the success of the grass I consider established beyond a doubt. The land I used was the poorest, worn-out pine land—too poor even to grow sweet-potatoes. I had the grass 8 feet high in some places, and I cut some of it three times during the summer.

Mr. Adams, of Jacksonville, Fla., says:

It does not "plant" or spread from the root during the first season as much as I expected, showing that probably the best way to start a field is by broadcast or drill sowing. But as to its adaptability to the climate and soil of the South, and of Florida especially, (where the greatest agricultural need is confessedly a grass that will bear sun and drought,) I have not a shadow of doubt. In two-thirds of the northern and southern extent of the State cattle are raised without any feed or care except grazing at large; yet there is an annual ratio of increase of more than 30 per cent., so that with an available grass to supplement the natural or wild grasses, Florida is bound to be an important cattle and stock raising State.

This grass is cultivated with very satisfactory results in Alabama. A Greensboro' correspondent says it should never be allowed to go to seed before cutting, as it is then too hard and woody for good hay, but ought to be cut when from two to three feet high. It then makes a palatable, nutritious hay, of which all kinds of stock are very fond.

In his report of experiments on the Madras (India) experimental farm, 1873, the superintendent, Mr. Robertson, gives the following as the methods pursued by him in the cultivation of Guinea grass:

Plow, scarify, and weed the land thoroughly; harrow, roll, and pulverize to a fine tilth; then ridge with the plow, making the ridges at distances of about 2 feet. Manure is then spread in the open furrow between the ridges. The plow is then passed along the line of the ridges, splitting them in the center, and throwing the soil over the manure on either side. The chain-harrow or the roller is then passed along over the surface of the ridges to consolidate them, and the plants (obtained by dividing into several parts old tussocks from another field) are planted on the ridge on the first showery day afterward, care being taken that they are planted uniformly at a distance of 2 feet apart in each direction; thus admitting of the plow being used between the lines of plants and across these lines at right angles. The after-cultivation is simple; little weeding is required if the crop was well manured at planting, but it is advisable to pass the plow or cultivator occasionally through and across the crop, as the absorptive powers of the soil can in this way be kept up. This plowing or cultivating should be repeated at any rate once after the removing of each cutting. A dressing of fold-yard manure should be applied between the plants and plowed in at least once a year. Before the end of the second year the plants, from frequent cutting, will have formed large tussocks. These must be reduced by simply chopping with a hoe or spade. We find it best to make two cuts across the tussocks at right angles to each other, thus dividing it into four parts. Of these, three are removed, and form excellent bedding for the cattle-stalls, the fourth remaining to perpetuate the crop. In this way there is no necessity to remove the plants to other ground, but care must be exercised to see that the soil is *properly* manured, as a crop which yields such *large* returns must necessarily make large demands on the soil.

As to its uses the report says:

The fodder can be used for all kinds of stock; at first it seems to disturb the digestive organs of some animals, but this is only temporary. I have fed cattle and sheep on it *exclusively* for *months*, not only without any ill effects, but with the most satisfactory results. I have found our Guinea-grass field a capital place in which to graze our working cattle during the hot season, and for the ewes with young lambs I could scarcely desire a better pasture. It produces such an abundant flow of milk in the ewes, without, what is common in such cases, disturbing the health of either mother or lamb.

THE DAIRY.

DAIRYING IN NEW YORK.

The census of 1870 reported the number of cheese factories in the United States at 1,313, of which 818, or nearly two-thirds, were in the State of New York. The factory and farm cheese product of the State was in similar proportion to the entire make of the country, while its proportion of the entire butter-product was more than one-fifth. These compared statistics will serve to illustrate the controlling position held by New York in respect to the general dairy interest.

At the meeting of the New York State Dairymen's Association, in December, 1873, the president of the association, Mr. X. A. Willard, said that the year had not been a very prosperous one for dairymen. Prices had not been sufficiently large to leave much margin, even had the season been an ordinarily good one. Furthermore, drought in May and June, short feed, and the early approach of cold weather in autumn had resulted in a large reduction of the average yield of milk. As to prospective prices, there was not much probability of their advancing beyond the governing prices of 1873. Still dairy goods have this advantage, that their market-value is less fluctuating than that of other agricultural staples; in spite of the discouragements of the year, dairying, speaking in general terms, appears to be quite as remunerative as other branches of agriculture. Mr. Willard expressed the opinion that the business is not likely to be overdone for some years to come. Notwithstanding dairying is being extended into new districts, consumers are increasing in equal degree. An annual immigration of half a million adds very sensibly to the home demand, at the same time that England is enlarging her calls. The New York cheese of 1873 was the finest and best flavored ever turned out by the factories of the State, and this fact gives encouraging evidence of improvement in production.

Official statements show a great increase in our cheese exports, which are exhibited at 91,358,077 pounds for the year ending December 31, 1873, against 65,459,462 pounds for the year 1872.

NEED OF SCIENTIFIC INVESTIGATION.

In an address before the New York Association, Mr. J. Stanton Gould urged the importance of a thorough investigation into the changes of structure which take place during the processes of cheese-making, suggested the raising of a fund for a commission of scientists to prosecute research on the subject, and also recommended the theme to the attention of professors and students of agricultural colleges. Dairymen are very imperfectly informed as to the chemical nature of these changes, and consequently are unable sufficiently to control them, under the various influences to which that sensitive substance, milk, is exposed. Every step in the formation of cheese and butter should be thoroughly understood and guarded by exact tests, and when such knowledge is put in the possession of manufacturers they will be able to secure a great advance in the quality, and therefore in the price, of their goods.

In the mean time it is to be regretted that many dairymen acknowledging in theory the need of perfect cleanliness in handling milk, and

the necessity of preserving it from exposure to impure odors, are yet careless in practice, seeming as it were to expect some special interposition of Providence to prevent the character of their goods from being lowered in consequence of violation of natural law.

THE APPLICATION OF HEAT IN CHEESE-MAKING.

Mr. L. B. Arnold said that the cheese of different districts varies in quality according to circumstances of feed, water, and practice of making, and one cause of variation in quality is the fact that manufacturers often consult their own fancy rather than the taste of the general public. It is desirable that dairy associations should collect samples and fix upon general standards of quality in order that a more uniform article should be placed upon the market.

In the different modifications of practice the management of heat is an essential element. Its general effect is to hasten fermentation. In making fine cheese it is important that the application of heat should be equalized throughout the whole mass; but at present we lack a system by which there can be secured a perfectly even diffusion of heat throughout all the curd. Two defects are often found in cheese manufacture, tending to an uneven diffusion of heat, namely, not cutting the curd in equal pieces, and not cutting sufficiently fine. The necessity of good curd is not sufficiently appreciated by the dairy community. Mr. Arnold added that Lewis County factories sold cheese at 1 cent to 1½ cent less than Herkimer and Oneida factories, and this inferiority of price was the result of want of care in the application of heat. The difference could not be charged to grasses or climate. In Herkimer County makers cut finer and are more particular to keep an even temperature throughout the whole mass. But in Lewis County, in examining the curd the outer part was found too hard, while underneath the substance was soft; curd in this state cannot be worked into fine cheese. In the curing-room were observed evidences of fermentation, the consequence of improper curd. He himself sets at 90°, maintaining the temperature as near that point as possible, by covering. If the milk is set at 80° more rennet must be used to hasten the cheese through its fermentation. The great defect of the day is in keeping quality. Quite commonly a large amount of rennet is used, not always pure, and consequently the cheese has a rank smell. Uniform temperatures should be maintained in making and curing; if cheese suffers a chill in three days from the press it acquires a bitterness that cannot be remedied. With regard to wastage from fine cutting of curd, Mr. Arnold thinks that methods are attainable by which, substantially preventing loss of heat from any part of the vat, the curd may be ripened for the press without cutting at all, securing advantage in economy of labor, and in weight and richness. He has seen cheese of good quality made in this manner.

FLOATING CURDS.

In the course of discussion Mr. W. S. Blaisdell, of Cherry Creek, inquired if really fine cheese could be made from floating curds, adding that some makers claimed to manage them easily and to find them not detrimental to quality of cheese. Mr. Arnold replied that his views on floating curds had changed. He had once supposed them the result of a putrefactive process, but applied tests had shown a decided acid reaction. Examination shows an animal odor constantly forming and escaping that is indicative, not of putrefaction, properly speaking, but of a change of condition in the albuminoids for which no sufficient name as yet exists. Tainted milk seems to be susceptible of better control by skillful cheese-makers than we had once supposed.

COMPETITION INCITING TO IMPROVEMENT.

The suggestions toward an improved practice offered at the meeting of the New York Association are enforced by the present aspects of the dairy trade. Notwithstanding the introduction of the cheese-factory system into England, our export business has little to fear from dairy operations there, taking into view the comparatively high cost of milk and other agricultural limitations existing in that country. But we have a neighbor who is entering into rivalry with us in the British market, namely, Canada, which within a few years has followed our lead in the factory system. Her exports of cheese to Great Britain, which in the year ending June 30, 1865, amounted to about 740,000 pounds, reached in the year ending June 30, 1872, the amount of 16,424,025 pounds, (for the Dominion of Canada, chiefly from the province of Quebec,) or nearly one-fourth the amount of our cheese export for that year. Her product is improving in character, and the cost of producing is less than with us. Skill in handling and superiority of quality are required on our part to offset her partial advantage.

DEVELOPMENT OF THE HOME MARKET.

Leading dairymen hold forth another inducement for securing all attainable means for improvement of cheese manufacture, the hope of developing that immense home-field in which demand is now relatively inactive. To this end the first requisite which suggests itself is a marked improvement in quality and uniformity of make. Yet, under current conditions, there are difficulties in the way of a rapid enlargement of the home demand. The English and American fields of consumption call for different qualities of cheese, the former asking for a cheese of firmer texture and more matured quality than the latter. In this country no one region at present absorbs any considerable quantity; therefore manufacturers generally find it more convenient to work for the large foreign market than to make special effort to supply the retail trade at home with a good article suited to local tastes. It is believed that these conditions of the trade have greatly impeded the growth of cheese consumption in this country. Experts declare that our best cheese is sent abroad to strengthen American reputation in the foreign market, and that the retail business here has been largely stocked with inferior articles; indeed, that a great proportion of the cheese retailed in this country has been little better than imperfectly dried curd, injurious to digestion, and therefore favoring the notion that cheese generally is an unhealthful article of food.

DAIRYING IN THE NORTHWEST.

At the meeting of the Northwestern Dairymen's Association, at Whitewater, Wisconsin, in January, 1873, Mr. W. D. Hoard said that in 1865 there were but 30 dairy factories in Wisconsin, and in October, 1872, the number had reached 150; there had been a similar increase in Illinois, and a smaller one in Michigan, Iowa, and Minnesota. Wisconsin alone in 1872 produced between six and seven million pounds of cheese. Until that year but little cheese was sent from those States to foreign markets; the product went chiefly to southern and western retail markets. Production is now largely in excess of local demands; besides, the latter commonly call for a soft, buttery cheese, an article which will not keep well. Such markets cannot be crowded. Furthermore, local freights being high, a large expense is incurred in distributing the

cheese. In manufacturing the Northwest has this advantage, namely, that the cost can be reduced to a lower figure than the expenses of eastern makers. In fitting up a dairy-farm in Wisconsin not more than one-half the capital is required that is necessary at the East, and the expenses of feeding and labor are smaller, while freights to Europe are but little larger than the New York figures. The Grand Trunk Railway, in 1872, offered to carry cheese from Milwaukee to Liverpool for 95 cents, gold. The shipments to England had had a good effect in stimulating the offers of Chicago dealers.

Mr. Hoard urged the establishment of additional dairy markets at convenient points in dairy districts, and pointed out the advantages of selling at such centers of general gathering rather than at individual factories, showing that the markets already existing of this description had sensibly improved sales of western cheese.

Dr. Stone, a well-known dealer of Elgin, Ill., did not agree with Mr. Hoard in entertaining a controlling preference for a foreign market. England cannot take all our cheese, and while the losses on inferior dairy-products in the West amount to many millions of dollars yearly, the western market is never overstocked with choice qualities. The home markets are really the best, and should be mainly relied on, although it is well enough to have some other outlet. The home demand should be sedulously stimulated by offering good qualities, and adapting styles of cheese to current tastes. Public sentiment must be brought to bear on unfair discrimination in local freights, but, as far as possible, freight expenses should be reduced by securing markets in the vicinity of production through inducements to neighboring merchants. Obtaining a good field at home, American makers will not be dependent on the English market and will be secured against any contingencies which may close the latter. He added that, in order to prevention of irregularity of market, manufacturers should unite in sustaining their local boards.

The cheese product of Wisconsin for 1873 is placed by officers of the Dairymen's Association of that State at over 10,000,000 pounds. The rapid growth of cheese manufacture in Wisconsin is illustrated by comparing this statement with the census statistics of 1870, showing a total cheese product of 3,288,581 pounds, including 1,591,798 pounds from 54 factories.

The report of the Northwestern Dairymen's Association for 1873 furnishes the following particulars concerning the dairy interest in McHenry County, Illinois, having a population of 30,000: Not quite seven years ago its first cheese-factory was erected, and now the county contains 30 cheese and butter factories. During 1873 there were worked up, in round numbers, 17,000,000 pounds of milk, from which were produced 1,500,000 pounds of cheese and 100,000 pounds of butter. There have also been shipped 1,000,000 pounds of milk to Chicago.

CHARACTERISTICS OF RIPE CHEESE.

Mr. Arnold gives the following characteristics of properly ripened cheese: Well ripened cheese has no elasticity when pressed with the finger; it feels as if breaking under the pressure, and the dent remains; it has a salvy, oily appearance when mashed between the thumb and finger, and melts on the tongue like a ripe pear; the cut surface remains soft and oily for a long time, not readily drying up. Unripe cheese, on the contrary, is elastic when pressed; hard or tough when mashed between thumb and finger; soon dries and cracks when exposed to the

air; when tested by the tongue is found deficient in fat, and does not dissolve readily. Cheese that dries quickly on being cut has not yielded up its curdy nature to the cheesy fermentation, and is therefore unfavorable to digestion.

PARTLY SKIMMED MILK FOR CHEESE.

The question of partly skimming milk in cheese factories continues to be discussed at the annual meetings of the cheese associations. It is argued by advocates of the measure that the whole cream cannot be retained in the cheese, and that in attempting to make from whole milk there is a considerable wastage of buttery matter passing off in whey; that under skillful management the night's milk can be skimmed with profit for butter, and used with whole morning's milk for a cheese which cannot be distinguished by experts from a strictly whole milk article; that in fact the best English cheese is less rich in the buttery element than the average of good American make. On the opposite side it is alleged that in the long run there is rarely any pecuniary gain in making butter and cheese from the same milk, the gain in butter being fully offset by loss in quantity and price of cheese; still further, that any extended practice of skimming in manufacture tends to lower the market reputation of our cheese, and thus works injury to the whole dairy interest. The weight of opinion among acknowledged dairy leaders is that partial skimming may be practiced with profit by thoroughly skilled adepts in good milk regions, and there is indicated a probability of future improvements in process which will allow a much wider adotipon of this practice than can now be prudently recommended.

AVERAGES OF CHEESE AND MILK.

At the meeting of the American Association in the early part of the year the average product of cheese per cow for Herkimer County, New York, was reported at not over 400 pounds yearly. The secretary of the Northwestern Association said that the factory reports received showed a low average per cow, lower than in New York; many dairies in the Northwest did not exhibit over 300 pounds of cheese per cow yearly, and in 1872 there was a difference of 2,000 pounds of milk in the averages of dairies represented in the association. Better cows were needed, better food, and better care. Efforts were being made to improve dairy stock, and the quality and reputation of the dairy products of the Northwest were improving, though western butter still bore a bad name.

VALUE OF FACTORY WHEY.

At the session of the Northwestern Association, Mr. C. K. Wilder, of Evansville, Wis., said that farmers are apt to overrate the value of factory whey, especially if it is to be carted back to the farm. His experience of twenty-three years in feeding whey has shown him that it is of comparatively little value if the cheese is properly made. The principal fattening element of whey is in the sugar; this commences to change to an acid before leaving the curd, and when fully changed loses its fattening property. The patron usually does not get the whey until it is twenty-four hours old, and by that time, in warm weather, it has lost fully one-half of its value. Therefore whey should be fed at the factory as soon as made. In 1872 he fed 207 tons of fresh whey at the factory, which, with corn, made 7,152 pounds of pork. The latter

sold for $232.44; expenses of buying, feeding, and selling were $142.20, leaving $90.24 as the net profit of the whey. This would be 43½ cents per ton of whey, or less than one-sixth of a cent on each 10 pounds of milk worked. If the whey had stood twenty-four hours before feeding its value would have been diminished one-half.

CARRYING MILK TO THE FACTORY.

In his judgment the most economical method of managing the delivery of milk at the factory is by establishing milk routes of such length that each will furnish a full load of milk, and in order to do this factories should be sufficiently far apart.

CHEESE FACTORIES IN MASSACHUSETTS.

The cheese factories of Massachusetts are situated chiefly in the western part of Worcester County and the neighboring towns in adjoining counties. It it said that the first cheese factory in the State was erected in 1864; since that time about thirty factories have gone into operation, some of which are not now in existence. The following presents leading points in reports of several of the larger factories, also comparisons with reports of these establishments for 1872: Worcester County Cheese Factory, Warren, capital invested, $5,200; length of season of 1873, April 1 to August 12; of 1872, April 1 to October 31; amount of milk received in 1873, 798,275 pounds; average amount of milk required for one pound of cheese in 1873, 10.32 pounds; in 1872, 9.787 pounds; range of weight of cheese in 1873, 60 to 75 pounds; entire expense of cheese at factory, per pound, 2.25 cents; expense of freight and marketing of cheese .9 cent per pound; net price paid to milk contributors per pound of cheese, 12.29 cents; in 1872, 11.982 cents. The net price received by milk contributors for each quart of milk in 1872 was 2.55 cents, and the tenor of the report for 1873 would indicate about the same value for that season. One man and one woman were employed in the factory in 1873, and an extra hand during a few weeks. Barre Central Factory: capital $8,000; season of 1873, April 10 to November 1; pounds of milk used, 1,531,437; average of milk for one pound of cheese 9.7 pounds; in 1872, for season from April 1 to November 30, 9.825 pounds. In 1873, cheese was kept at the factory thirty to fifty days; weight of cheese 40 to 75 pounds; net price paid to milk contributors for cheese per pound 11.87 cents; in 1872, 11.96 cents. The report for 1872 stated the net income from whey at 50 cents per 1,000 pounds of milk. Barre South Factory, season of 1873, April 30 to November 8, pounds of milk used 806,072; average of milk for one pound of cheese 9.92 pounds; in 1872, 10.3 pounds, for season from May 1 to November 1. Entire expense of cheese at factory in 1873, per pound, 2.2 cents; expense of freight and marketing of cheese, per pound, .725 cent; net price received by milk contributors per pound of cheese, 12 cents. New Braintree Factory, season of 1873, April 15 to November 14; of 1872, April 2 to November 29; average of milk for one pound of cheese in 1873, 10.25 pounds; in 1872, 10.22 pounds. Milk used in 1873, 1,339,922 pounds; net price received by milk contributors per pound of cheese, 11 cents, the same as in 1872. Hardwick Center Factory, 1873: capital invested $4,250; began to make cheese in March, finished in November; milk used 1,689,407 pounds; milk for one pound of cheese 9.644 pounds. Two men and one woman were employed in the factory. Net price paid to milk contributors per pound of cheese 12.04 cents. Cheese was kept at the factory six weeks. Expense of cheese at the factory, 2.54 cents per pound.

REFORM IN BUTTER MANUFACTURE.

The waste exhibited in this country in the matter of badly manufactured butter is so enormous that it rarely fails to be emphatically alluded to in the discussions of the associations, and butter making in factories is put forward as the most effectual means toward checking this evil. It is held that differences in butter making can be reduced, if not equally, at least in like manner, as in cheese making. Now, while cheese manufacturers have ready intercommunication, and consequently a great similarity in methods of practice, the case is very different with the great mass of butter makers. The latter are for the most part working individually and without associated organization, and under great diversity, often opposition, in practice. Mismanagement in making and marketing may be said to be the rule instead of the exception.

At one of the sessions of the Western New York Butter Makers' Association, several members said in effect that while most farmers believe themselves able to make good butter there is but little of first-rate quality received in market. Statements of persons conversant with eastern and western markets are of similar character. One conducive to the low average of quality is the practice of country storekeepers in paying nearly the same price for good and poor butter, making the profit on the former counterbalance losses on the latter. A late editorial in the New England Farmer represented that one-half to two-thirds of the butter brought to the Boston market was really unfit for table use, and that washing, bleaching, coloring, &c., were largely resorted to in manipulating the inferior material. Dr. Stone, of Elgin, Illinois, already alluded to as a dealer in dairy products, reports that he paid 35 cents per pound for factory butter, buying packages and paying freight, at the same time that poor butter stood at 9 cents per pound; the difference in quality was owing to difference in making. The use of common salt is one cause of poor butter. In the majority of cases where he has purchased farm-butter he has suffered loss, while he has almost always made profits on the fancy factory butter for which he has paid large prices.

FALSE QUOTATIONS.

At a meeting of the Western New York Association, Mr. O. H. Fields cautioned dairymen that they should keep themselves thoroughly informed on market prices, and related the case of a dealer who while selling first-class butter in the market at 45 cents per pound quoted the top price of the market at 30 cents. Mr. A. Burnham said that having been in New York but a few days before, he found there the highest quotations for butter were 33 to 35 cents, though sales were made at 50 cents, some dealers refusing offers at that figure.

REQUISITES OF BUTTER MAKING.

Mr. O. C. Blodgett, an expert in butter making, gives the following requisites of management: Good care of cows; scrupulously clean milking and clean tin pails; setting of milk at a maintained temperature of 60°, with admission of light to develop color in cream, and in winter keeping the air moist by the evaporation of water in a vessel on the stove; perfect quiet of the milk while setting, and absolute purity of the surrounding atmosphere; skimming at the end of forty to forty-eight hours, by which time the milk will have soured—if desired for convenience in churning, the cream may be put in a tin can and placed in a

cellar or well and kept twenty-four hours longer at a temperature of 55° Churning should be at a temperature of about 62°. The old-fashioned dash churn is still in high favor among butter makers, and is largely used in the creameries. Washing the butter is generally advocated by experts, and the water used for this purpose should be perfectly pure, clear, and destitute of odor. Water should be applied freely until all the buttermilk is removed. The butter is then to be salted, worked well, and left to stand twelve to twenty-four hours in a cool place in thoroughly pure air, in order to harden, then worked again carefully, pressing out whatever brine may have remained. In respect to preservation of proper temperature of milk rooms in midsummer, two methods are pursued: one is by the use of running water, the other (especially in the absence of such supply of water) by means of peculiarly constructed milk houses, where ice is employed to bring down the temperature.

Mr. Blodgett adds, that in conversation with a commission merchant in New York City, receiving large amounts of farm butter, the latter gentleman said that within about three years, during which time the butter question has been freely discussed, his receipts from producers have averaged an improvement of 5 per cent. in quality over former consignments.

CONSTRUCTION OF MILK HOUSES.

A statement by Mr. A. M. Blanchard, to the Western New York Association, is to the following effect: After many experiments in cooling and setting milk, he has adopted the plan of cooling his milk as soon as it comes from the cow to a temperature of 50° to 52°, using a patent cooler, then carrying to his dairy-house, made of concrete with double walls, between which is an interval of 8 inches in depth. Into this house he admits air only at night, and here he is able to keep his milk two days before skimming, even in the hottest weather, and it is sweet when skimmed. He has tried setting milk at all depths, from 15 inches down to 2 inches, and thinks 8 inches the best depth when a cooler is used. He finds that the amount of milk required for one pound of butter varies greatly under apparently the same circumstances, sometimes ranging within two days from 28 pounds to 23 or 24 pounds of milk. His cows are grade short-horns.

SWEDISH SYSTEM OF SETTING MILK.

A report by M. Juhlin-Dannfelt, superintendent of the Royal Agricultural College at Stockholm, on the butter factories conducted by the Malar Lake Dairy Company of Sweden, shows that in these establishments a radical change has been made in the hitherto accepted practice of setting milk for butter, the change consisting mainly in the rapid reduction of the milk to a low degree of temperature by the use of ice. The new method has an advantage in economy of water in localities where resort cannot be had to cool, running streams. The report says that the ice water requires to be completely renewed only a few times yearly.

The milk is to be delivered by the farmers at the company's depots as soon as possible after milking, without straining at the farm, the object now being to delay cooling till the milk arrives at the point of delivery, since the cream begins to rise as soon as the cooling process commences, and any interruption in this rising is injurious. The shorter the distance of transportation the more cream is yielded; therefore milk houses are established by the company at such intervals that no milk is transported

more than one and a half miles, and the cream is forwarded from these to the butter factory. The tanks for cooling milk are adapted in dimensions to the quantity to be treated. At the central factory they are made of 2-inch plank, and are 9 feet long by 3 feet wide and 2 feet deep. A grate is fastened at the bottom, inside, on which the milk pails are placed so that the ice water may circulate beneath them. In a tank of this size about 138 wine gallons of milk may be set.

The milk pails formerly used were 18 inches in diameter and 24 inches deep, but for the purposes of the new system pails are now made about 9 inches in diameter and 20 inches deep. The old pails were adapted by removing the bottoms and compressing the sides to a small diameter of 7 inches, and then refitting the bottoms. Many farmers for their own use prefer this form and size as involving less outlay and presenting advantages in skimming. As soon as the milk is received it is strained into the pails, which are then set in the tank 3 inches apart. The supply of ice for the milk rooms is made equal in amount to the quantity of milk to be cooled, though it is understood that with good management a smaller amount would suffice. The ice for the tanks is chopped in pieces 3 to 4 inches square, and cooling being accelerated by this means, the water is reduced in summer to a temperature of 35° to 39°; 18 to 24 hours is stated as the suitable period for setting. In winter the temperature is not to be reduced below 50°.

At the central factory, on an average, during 1871, about 13⅗ quarts of milk appear to have been required for one pound of butter. Milk purchased from neighboring well-managed dairy-farms required 31.5 pounds of milk for one pound of butter, while cream churned on the farms showed 26.7 pounds to 30.2 pounds of milk for one pound of butter, the difference being attributed in large degree to the effect of transportation.

While, therefore, the system may be of advantage under certain local conditions, it will be seen that the report does not indicate a high average of butter to milk.

MONTHLY AVERAGES OF BUTTER FROM MILK.

Mr. John T. Ellsworth, a well known dairyman of Barre, Mass., reports the following averages of milk required for one pound of butter, being the results of careful tests made during one week in each month from March, 1871, to January, 1872, inclusive. The milk of his whole herd was taken, the latter consisting of high-grade short-horns: March, 12.5 quarts; April, 12.4 quarts; May, 12 quarts; June, 12 quarts; July, 12.2 quarts; August, 15 quarts; September, 12 quarts; October, 11.7 quarts; November, 11.5 quarts; December, 9.8 quarts; January, 10 quarts.

CHOICE BUTTER.

A correspondent of the Boston Journal of Chemistry gives an account of the dairy farm of the Messrs. Darlington, at Darlington Station, Pa., on the West Chester and Philadelphia Railroad. The farm consists of 350 acres, and the dairy herd of 80 to 100 cows, mostly of native stock, selected for their butter qualities. There are two large spring-houses; one of them 32 feet by 46 feet, 1½ stories high, and built of stone, contains a never failing spring which delivers about 8 gallons of cool water per minute. The milk room is 24 feet by 28 feet, and the milk is set in large pans, the largest holding 500 quarts. The churning is done twice a week, each churning returning on an average 650 pounds of butter, destined for regular customers in Philadelphia and New York. Prices during 1872 varied from 65 cents to $1 per pound. The buttermilk and skim-milk are fed to hogs, numbering from 60 to 70.

Mr. W. V. S. Beekman, of Saugerties, N. Y., who took the highest prize for small packages of butter at the State Fair in Albany, 1873, says that the sample exhibited by him was part of a regular churning, made up according to his usual method. His experience has convinced him of the superiority of Jersey cows for the production of "gilt-edged" butter. He gives his animals all they will eat, of the very best food. Average daily ration, in winter, 20 pounds of bright, early-cut clover hay, 4 quarts of fine corn meal, and one peck of roots—carrots, parsnips, sugar-beets, &c.; in summer he gives an abundance of soiling crops in addition to pasture. In the hottest weather he has made butter of superior quality while feeding fodder corn, 2 quarts of corn meal, and a little hay, twice a day. He uses stanchions, being led to prefer these after considerable experiment; the cows stand on an elevated platform, with an 18-inch wide gutter at the rear. Before milking the stables are cleaned out, and absorbents put in the gutter and fresh straw in the stalls. The cows are then brushed off, and their udders sponged with tepid water. In illustration of his success in management, Mr. Beekman remarks that in August, 1872, a month characterized by intense heat and violent thunder showers, he was able to make as firm butter as in June and October. He prefers deep cans for setting. The temperature of his spring ranges from 40° to 50° during the year; the spring house, a temporary erection, is a rough board building 8 feet square and 6 feet high. Before churning he sets the can of cream into a tub containing water at about 70°, and stirs the cream till the latter is brought to 62°, as exhibited by a cheap thermometer made for the purpose. The cream is churned sweet, three times a week, in an old-fashioned dash churn. After churning the butter is taken out, 8 or 10 pounds at a time, into a bowl, and washed once, rapidly, most of the buttermilk being removed in this washing. One-half of an ounce of finely sifted Ashton salt is used for each pound of butter. The working is finished on a low oaken table having its upper surface in an inclined plane, and the butter is carefully pressed, all moisture being absorbed by repeated applications of thin muslin, which is found preferable to sponge. Mr. Beekman packs in earthen jars in summer and in oaken tubs in winter, and sends to private customers in New York. He ships by night boat in summer and prefers not to use ice, thinking it injurious to flavor; obtains 65 cents per pound, and places the cost of winter feeding, in his case, at a daily average of 60 cents per cow.

During the latter part of the summer, and at the commencement of autumn, Mr. Beekman appears to have been receiving about double the highest regular wholesale quotations, (prime Orange County pails, &c.) In view of his secured, constant market at so high a price, it is evident that, notwithstanding his extra outlay for stock and feed, his investment gave a good return. But he cautions against too high an estimate of the profits in making "gilt-edged" butter. Care and persistence are required toward attaining the necessary skill and reputation. He adds, and the point is a significant one, that he has been in the dairy business only two years. He keeps six cows, and feeds and milks his stock, and churns and works the butter himself.

The wholesale quotations of best butter in New York City during 1873, (fine Orange County pails, &c.,) averaged about 40 cents for the year, reaching 50 cents in March and April, at which time "good dairy" butter touched 40 cents as its highest extreme, dropping to about 25 cents in summer. A very suggestive contrast to this exhibit of even good market grades is afforded by the statements of New York papers that Mr. Crozier, of Long Island, received throughout the year 75 cents for his whole make of butter, selling to special customers. It is well said

by prominent dairymen that there is scarcely a town of any considerable size throughout the country that will not furnish customers for specially fine butter at prices much above current retail figures.

At the meeting of the Vermont Dairymen's Association in January, 1873, Mr. Obed Whipple, of Pomfret, said that he had kept cows for twenty-five years; sells his butter in Boston at 60 cents per pound. From 22 grade Jersey cows he had made, since April 1, 4,900 pounds of butter, and the milk and cream of the cows had been used by twenty-two persons. He gives his cows 2 quarts of corn meal daily throughout the year; cools the milk by setting in water before straining, and sets for cream in a cool room, without ice, thirty-six hours in the warmest weather; uses one ounce of Ashton salt and one-half ounce of sugar for a pound of butter; puts up his butter in balls weighing one ounce and four ounces, in tin cans eighteen inches high, and subdivided by shelves. Each can is boxed before shipping, and will hold 192 four-ounce balls and 36 one-ounce balls; cost of the can, $11. His wife will ball 25 pounds of butter in 1½ hours.

AVERAGES OF PRODUCTION, ETC.

The averages involved in the statistics of butter and cheese production are frequently brought forward at the meetings of dairy associations to show the progress of these industries and to illustrate certain points connected with their management. The census of 1870, supplementing other data, affords us the means of presenting some of these averages with more precision and completeness than have hitherto been possible. The following abstract is founded chiefly on the census publications of the three past decades, compared with official tables of imports, exports, &c.:

From 1850 to 1860 there was an increase of 47 per cent. in the butter product of the United States, and a decrease of 2 per cent. in the cheese product; increase of population 35½ per cent. From 1860 to 1870 the cheese product increased 57 per cent., and the butter product 12 per cent.; increase of population 22½ per cent. For the twenty years from 1850 to 1870 the increase of the cheese product was 54 per cent., and that of the butter product 64 per cent.; increase of population 66 per cent. The growth of the cheese interest from 1860 to 1870, consequent on the rise and extension of the cheese factory system, presents a remarkable contrast to the exhibit of the preceding decade. The average annual export of cheese (domestic product) during the ten years ending June 30, 1870, was 43,641,796 pounds, against an average of 7,853,383 pounds for the preceding decade. The exports for the three years ending June 30, 1873, were as follows, respectively: 63,698,867 pounds; 66,204,025 pounds; 80,366,540 pounds.

The census of 1870 states the number of cheese-factories in the United States at 1,313, and their product of cheese at 109,455,229 pounds, showing an average of 83,363 pounds per factory; number of cheese factories in New York 818, averaging 95,362 pounds of cheese. This statement of production chiefly covers the favorable season of 1869. On referring to the New York State census of 1865, it is found that the reports of 380 factories exhibited an average of 83,278 pounds of cheese, and 424 reports showed an average of 307 cows per factory for the season. One hundred and thirty-three factories, "using the milk of 300 cows and upward," gave full statistics, including the length of the working season, the latter averaging a little more than six months; average number of cows 504; average yield of cured cheese per cow 283 pounds; average product of cheese per factory, 142,432 pounds.

From comparison of all attainable data it would appear that in 1869

and 1870 the cheese factories of the United States did not average over 300 cows each, and that the average of cheese per cow for the working season fell below 300 pounds. There is no reason to believe that this average of cows has been increased since that time; indeed, the reports of the dairy associations have indicated a tendency in the contrary direction. New York factory statements, appearing in the reports of the American Dairymen's Association, show that 400 pounds of cheese per cow for a season of seven months to seven and a half months fairly represent the extreme averages of the State—that is to say, averages covering a long season.

The United States census exhibits of 1850, 1860, and 1870, collated with statistics of export and import, show, for each individual, an average yearly consumption of butter ranging from 13½ to 14½ pounds, the latter figures being for the middle period, or that of 1860. The average consumption of cheese has ranged from very nearly 3 pounds to 4 pounds, the latter being the exhibit of 1850. For 1870 the rate was a little over 3 pounds per individual. Mr. G. E. Morrow, of Madison, Wis., secretary of the Northwestern Dairymen's Association, states that Madison, with a population of about 10,000, averaged in 1872 a consumption of 4 pounds of cheese per individual.

The following table shows the rates of increase of the butter and cheese product during twenty years in the States named, with the rates of increase of population:

States.	Per cent. of increase of population.			Per cent. of increase in amount of butter produced.			Per cent. of increase in amount of cheese produced.		
	1850 to 1860.	1860 to 1870.	1850 to 1870.	1850 to 1860.	1860 to 1870.	1850 to 1870.	1850 to 1860.	1860 to 1870.	1850 to 1870.
New York	25½	13	41	29	4	34	Loss, 2½	107½	102½
Pennsylvania	25½	21	52	47	4	53	....	11	11
Ohio	18	14	35	41	3½	46	4	12	16
Illinois	101	48½	198	124	28½	188	44	212	349
Michigan	88	58	197	119½	57	245	62	41½	129
Iowa	251	77	521	450	130	1,167	338	46	540
Wisconsin	154	36	245	274½	65	518	176	198	722
Vermont	0⅓	5	5	31	12	47	Loss, 6	Loss, 5	Loss, 10½
Indiana	36	24½	70	42	25	78	Loss, 3	Loss, 34½	Loss, 37
Massachusetts	24	18	46½	3	Loss, 21	Loss, 19	Loss, 25	Loss, 22	Loss, 42
Maine	8	Loss, 01-5	7½	26½	Loss, 0½	26	Loss, 26	Loss, 36	Loss, 53
New Hampshire	2½	Loss, 2½	......	Loss, 0½	Loss, 14	Loss, 14½	Loss, 30	Loss, 61	Loss, 73
North Carolina	14½	8	23	14	Loss, 9	3½	Loss, 47	142½	29

MILK RECORD FOR THREE YEARS.

Mr. Gerritt S. Miller, of Peterborough, N. Y., reports the milk yield of his imported Holstein cows for the three years ending April 1, 1873, as follows:

Names.	Year.	Age, years.	Weight in September.	Days in milk.	Milk.	Average daily yield.
			Pounds.		*Pounds.*	*Pounds.*
Dowager	1870	6	1,275	365	12,681	34.74
	1871	7	1,215	365	11,528	31.58
	1872	8	1,225	257	6,480	25.21
Crown Princess	1870	5	1,270	293	9,379	32.00
	1871	6	1,270	258	10,691	41.44
	1872	7	1,225	365	11,766	32.23
Franlein	1870	4	1,225	327	6,980	21.34
	1871	5	1,235	245	7,893	32.21
	1872	6	1,202	365	8,588	23.53

Mr. Miller remarks: "Crown Princess's daily average for three months was 60.08 pounds. Princess completed her last year's record March 8, 1873. I have given her credit for twenty-three days and 288 pounds of milk to bring her record down to April 1, 1873."

According to the above statement, during the whole term of three years Dowager was in milk 987 days, and produced 30,689 pounds of milk, averaging 31.09 pounds daily; the average of Crown Princess for 916 days is represented at 34.75 pounds daily; Fraulein, 937 days in milk, gave 23,461 pounds of milk, averaging 25.04 pounds daily. Average yearly yield per cow, 9,598 pounds. Crown Princess gave on one day 74.5 pounds, Fraulein on one day 70 pounds, Dowager on one day 58 pounds of milk.

The cows were imported in October, 1869. The first winter, after being dried off, they were kept on hay. The two following winters each had two quarts of grain daily, with hay. Mr. Miller's course of feeding has been to give each cow in milk six quarts of grain daily, with long hay, during spring, and four quarts daily during autumn and the early part of winter. The grain feed has generally been composed of corn and oats in equal proportions, ground, sometimes of corn meal and shorts, or corn meal and barley, fed dry. From about the 1st of June until the early part of September or later, according to the character of the season, the cows have been kept on common pasture, with corn fodder in the pasture after September 1. Mr. Miller states that he has kept ten to fifteen native cows with the Holsteins, and that their average yield of milk per year, by record, has been about 4,000 pounds each. He is satisfied by his experiments in weighing the food and milk of the natives and Holsteins that the latter produce more milk from a given quantity of food than the former.

RECORD OF EIGHT JERSEY COWS.

The following is the milk record of eight thoroughbred Jersey cows belonging to Mr. Andrew Robeson, of Newport, R. I. Three of the cows were five years old, three four years, one seven years, and one eight years old. No statement of description or amount of feed is given:

Names.	Date of commencement of record.	Number of days in milk.	Total milk.	Daily average.	Average percentage of cream.
			Pounds.	Pounds.	
Locket	April 10, 1872.	265	5,065½	19	19.20
Gala	Feb. 12, 1872.	370	7,580½	20½	16.87
Rosemary	April 12, 1872.	252	3,069½	12¼	19.65
Zoe Le Bas	April 23, 1872.	304	4,760	15⅝	16.40
Silver Grey	May 2, 1872.	303	6,054½	20	15.37
Alice	May 2, 1872.	300	6,706½	22⅓	16.52
Zillah	June 12, 1872.	262	6,122½	23⅓	11.49
Cannie	July 9, 1872.	266	5,169	19⅖	17.62
Average		290	5,566	19	16.64

THE OSIER-WILLOW.

The following letter relative to the culture and economic importance of the osier-willow is from a practical cultivator:

LYONS, N. Y., *January* 23, 1874.

DEAR SIR: * * * * * Having planted a small piece of willows on my place, using them for tying nursery-stock, noting the market price for years, and having ascertained the annual product of a five-acre lot of willows adjoining the nursery, I became satisfied that with proper soil and attention the willow-crop would pay from $100 to $125 per acre each year after the second from the time of planting, and the annual expense for labor would not exceed $20 per acre each year.

In making my estimate of the large profit from growing osier-willows I did not take into account the ravages from worms, having cultivated them for so many years and never having experienced any losses from this source.

In 1871 I set out five acres of osier-willows (*Salix viminalis;*) they were planted on a soil of black muck, were kept clean and well cultivated; they attained a growth of 2 to 5 feet; were fine and thrifty. In the month of August there appeared on them a few black and yellow worms that fed on the leaves. These worms did little damage that year; the willows made a superior growth, and, although but one year from the cutting, I sold several tons for $10 per ton green and unpeeled; but it is not usual to have any salable willows the first year, and when the stools are two or three years old the willows make canes from 5 to 9 feet, and command here from $20 to $25 per ton at the railroad depot.

I sent some specimens of these worms to Dr. Fitch, and he wrote me as follows in regard to them:

"The worms you send me on the willows are a species of the saw-fly family, *Tenthredinæ*. I am not aware that this worm has ever been reared to its perfect state, to know which species of saw-fly it is that produces it. I met with a cluster of these same worms on the wild willows here September 19, 1855, and again in September 28, 1861. When done feeding they crawl into cracks and crevices, and there spin cocoons, in which they remain through the winter. I kept the specimens I tried to rear too dry, whereby they all died. I shall now try to breed the fly from these worms of yours.

"It is not probable these worms will be a permanent detriment. Another year, perhaps, you will not see one of them. But on such a large plantation of willows as yours, it may be that some of them will be appearing almost every year, and occasionally will come a year when they will be quite numerous. We have three or four other saw-fly worms about as common as this on the willows. One is watery-white with two or four broad green stripes; another is white with rows of black spots. They are closely related to the worms which of late years have been such a pest on the currant and gooseberry; and I have no doubt that you can kill every one of these willow-worms by dusting them with white-hellebore powder."

Relying upon the statement of Dr. Fitch that "it is not probable that these worms will be a permanent detriment," I prepared ten acres adjoining the first willow planting, and in the most thorough manner put out 150,000 more willow-cuttings; these grew finely, but, alas for human calculations! About June the worms came in myriads upon both plantations, denuding the foliage of the young willows to such an extent that many of them died, and impeding the growth of the older ones so much that few of them were merchantable.

In June I addressed inquiries through the Rural Home, of Rochester, N. Y., and the New York Weekly Tribune, that if any one knew the habits of the worms, or the extent of the injuries they were liable to inflict, that they would reply. In the Weekly Tribune of July 10, 1872, Mr. Charles V. Riley, the eminently practical entomologist of Missouri, answered as follows:

"In the Tribune of June 29, Dr. E. Ware Sylvester, Lyons, N. Y., refers to certain black and yellow worms which have been numerous on his osier-willows for the past two years, and which it appears Dr. Fitch was not acquainted with. If, when full-grown, they are with a row of twelve yellow spots on each side and fourteen pale-blue prolegs, they are the larvæ of a black saw-fly, (*Nematus ventralis, Say,*) belonging to the very same genus as the imported currant-worm.

"This insect is quite common on our willows in the West, and I have received it on a few occasions from New York. The eggs from which the worms hatch are translucent and partly imbedded in the under surface of the leaf. When young the worms are entirely black and only acquire their yellow spots after the last molt. They enter the ground to undergo their transformations, and there are two annual broods, the last

remaining in the ground through the winter. White hellebore is an effectual remedy, and, if used at the proper seasons, namely, when the worms are just hatched, at which time they are most gregarious, its application will be found practicable and profitable.

"In this latitude the worms hatch during the fore part of May, and again during the latter part of September."

During the summer of 1872 I sent some of the worms and flies to Mr. Riley, which elicited the following reply:

"OFFICE OF THE STATE ENTOMOLOGIST,
"*Saint Louis, Mo., Oct. 4, 1872.*

"MY DEAR SIR: The flies accompanying the worms you send are, as you infer, the parents of the latter, and are, as I supposed, *Nematus ventralis*, Say. Beyond what I have said in the Tribune, all I can suggest now is that, if practicable, you thoroughly inundate your land about a month during the latter part of April and fore part of May next. Draw the water off about the middle of May, and hire a lad for the next month to do nothing else than hunt for the eggs and young larvæ. Please keep me posted as to your doings and results. I will write you more fully when I find time.

"Yours truly,

"C. V. RILEY.

"E. WARE SYLVESTER.

"P. S.—While some of the worms spin up above ground, most of the fall brood go below the surface. Follow my advice, if you can, and I think you will not be troubled next year."

I was not able to follow the advice in reference to flooding without involving a very large expenditure or flooding the lands of my neighbors.

These willows were cut back carefully in the autumn of 1872. Those alive made a fair start in the spring of 1873, but as soon as the warm weather had fairly commenced the worms began their ravages. I was in hopes they had been killed by water, which covered the ground about a week in the spring. On and still on the worms came in myriads, and during the summer they feasted to their entire satisfaction, though not quite so satisfactory to me in a pecuniary point of view. The result was that I did not cut a willow from the fifteen acres in the autumn of 1873.

I found the same worms on the laurel-leaved willow in my ornamental grounds, but a thorough application of white hellebore with a bellows put them to death and saved the trees. I regard the laurel-leaved willow as one of the most beautiful which can be planted, if kept sheared in shrub or small-tree form.

How to kill the worms.—I staked off three rows of willows well covered with worms. On one I put white hellebore; on the second, lime fresh slaked in fine powder; on the third, unleached wood-ashes.

The examinations on the following days disclosed the following results: The hellebore killed the worms, and they were lying on the ground ready for burial. The ashes seemed to drive them away, for they could not be found on the bushes; probably had changed their location to the next row. The lime they seemed to relish, probably as an appetizer, affording a mineral element desirable for their health; at all events they made good time, and devoured all the leaves and all the accessible lime.

I learn that a plantation of sixty acres, near Syracuse, has been denuded of its foliage this year, as well as many other smaller lots of willows.

I am still of the opinion that without worms it is a very profitable crop on suitable soil, and it is certainly desirable to save the half million of dollars sent to foreign countries annually for willows and willow-ware.

Yours, &c.,

E. WARE SYLVESTER.

HON. FRED. WATTS.

INDIGO.

The cultivation of indigo in the United States has been almost wholly abandoned. At one time it was very extensively grown, and with great profit to the producers. Considering the great demand for this dye, used by almost every family for domestic purposes, and by manufacturers in wool and cotton, it is a matter of surprise that greater attention has not been turned to the practicability of home culture, inasmuch as a large region of the country is well adapted to its successful cultivation.

It is the intent of this article simply to show what has been done in this country in indigo cultivation at a former time; what is the present

condition of the foreign trade in it; the methods adopted in India, whence the best quality of the dye comes, for extracting the coloring matter from the plant; and also the modes pursued to the same end at present in the South, where the indigo-plant is still cultivated to a limited extent. Simple facts are given, and the further investigation of the subject, through practical experiments, left to those who feel an interest in the promotion of new industries at the South.

It is not unlikely that among the causes of the abandonment of the culture were, first, the large amount of land required to be employed where the industry is conducted as a specialty; and, second, the risks and hazards in the way of successful manipulation after the fitting maturation of the plants. In the Indies the conditions of cheap land and labor are met, but still the crop is regarded as one of the most precarious of the East, being liable to be destroyed by hail-storms. Plenty of land, labor at fair rates, and skill in handling enter prominently into the question of production for profit. It will be remembered, at the same time, that indigo is a nitrogenized product, and would therefore require the use of manures rich in ammonia to maintain the soil in a condition to yield a remunerative crop. The dye is not found in the growing plant, but is formed by chemical reaction among the proximate principles in the plant in their fermentation or incipient decay, and therefore skill in eliminating the coloring matter is absolutely necessary. Yet the considerable price per pound which a good article of indigo commands would seem to invite attention to a consideration of the possibilities of its cultivation. Loudon, in his Encyclopædia of Plants, speaking of the cultivation of indigo in the East and West Indies, says that seventeen negroes are sufficient to manage twenty acres; and one acre of rich land, well planted, will, with good seasons and proper management, yield five hundred pounds of indigo in twelve months, for the plant ratoons, and gives four or five crops a year; but must be replanted afterward.

The annual report of the Chief of the Bureau of Statistics for 1872, under the head of the quantity, value, and duty of foreign merchandise entered into consumption in the United States during the fiscal years ended June 30, 1870, 1871, and 1872, shows the following, as relating to indigo:

Years.	Quantity.	Value.
	Pounds.	
1870	1,423,204	$1,373,241
1871	2,101,867	2,115,914
1872	1,458,735	1,496,876

The summary statement of foreign exports, the growth, produce, and manufacture of foreign countries, from the United States during the fiscal year ended June 30, 1872, shows the export of indigo to have been 77,152 pounds, valued at $110,949.

The wholesale quotations for indigo in the New York market change very little from year to year, as may be seen by the following quotations for June of the years named:

Indigo.	1870.	1871.	1872.	1873.
Bengal .... per pound.	$2 30 to $2 50	$2 25 to $2 50	$2 25 to $2 50	$2 25 to $2 50
Guatemala .... do.	1 90 to 2 00	1 80 to 1 90	1 80 to 1 90	1 80 to 1 90
Madras No. 1 .... do.	1 50 to 1 60	1 30 to 1 40	1 25 to 1 35	1 10 to 1 20
Manila No. 1 .... do.	1 45 to 1 55	1 35 to 1 45	1 25 to 1 35	1 10 to 1 20

It will thus be seen that the indigo of the four qualities named commanded at wholesale jobbers' rates, in the market of New York, during the last four years, an average of $1.75 per pound. The difference in price will also be noticed. In Hindostan indigo is, for the most part, prepared from the variety *Nerium tinctorium;* the *Indigofera tinctoria, argentea,* and some other species are cultivated; but in the West Indies the *I. anil* is chiefly relied on.

In 1828 Thomas H. Benton, then in the Senate of the United States, in proposing the imposition of a duty on indigo, strongly advocated the reviving of its culture as a staple. In the course of his remarks he said:

Indigo was first planted in the Carolinas and in Georgia in 1740, and succeeded so well as to command the attention of the British manufacturer and the British Parliament. An act was passed for the encouragement of its production in these colonies in the reign of George III. The act promised a premium of sixpence sterling for every pound of indigo imported into Great Britain from the Carolinas and Georgia. Under the fostering influence of this country, the cultivation became great and extensive. In six years after the passage of the act, the export was 217,000 pounds, and at the breaking out of the Revolution it amounted to 1,100,000 pounds, and the southern colonies became rich upon its culture. Indigo and rice were their staples. After the Revolution, and especially after the great territorial acquisitions which the British made in India, the cultivation of American indigo declined. India was now looked to for indigo, and the American export rapidly declined. In 1800 it had fallen to 40,000 pounds, and in a few years to 6,000 or 8,000 pounds. Our manufactories were growing up, but having no supply of indigo at home, had to supply themselves from abroad. In 1826 this importation came up to 1,500,000, costing but a fraction less than $2,000,000.

Mr. Benton thought it a wise and prudent policy to follow the example of the British Parliament in the reign of George III, and provide a home supply of this indispensable article. For fine indigo our manufacturers were not paying less than $2.50 a pound. Mr. Benton then went into an exposition of the reasons for encouraging the home production of indigo, and showed that the life of what was known as the "American System" depended upon it. Neither cotton nor woolen manufactures could be carried on without indigo. The consumption of the article was prodigious. The stoppage of the supply for one year would prostrate all our manufactories and give them a blow from which they could not recover in many years. The tariff of 1816 contributed to destroy the cultivation of indigo, sinking the duty from 25 to 15 cents a pound. He said:

The quality was the same which laid the foundation of British manufactures, and sustained their reputation for more than a century. The two Carolinas and Georgia manufactured as much fifty years ago as we now import, and at present additional States—Louisiana, Alabama, Mississippi, Florida, Arkansas, &c.—produce it.

In the section on Agriculture, of the Patent-Office Report for 1853, it was shown that the amount of indigo exported from Charleston, S. C., in 1731, was 100,000 pounds; in 1747–'48, 134,118 pounds; in 1754, 216,924 pounds; in 1760–'61, 399,366 pounds; for a few years preceding the Revolution, annually, 1,107,660 pounds; in 1792, 2,458 barrels; in 1794, 2,157 barrels; from Savannah, in 1755, 4,508 pounds; in 1760, 11,746 pounds; in 1770, 22,336 pounds; from Philadelphia, in 1796, 99,200 pounds; from the United States, in 1794, 1,550,880 pounds.

The quantities and valuations of indigo of domestic production exported within thirty-three years were indicated in the following table:

Years.	Indigo.	Value.	Years.	Indigo.	Value.
	Pounds.	*Dollars.*		*Pounds.*	*Dollars.*
1820-'21	1, 004	714	1837-'38	50	50
1821-'22	3, 283	2, 399	1838-'39	....	....
1822-'23	2, 990	2, 314	1839-'40	209	209
1823-'24	818	836	1840-'41	....	....
1824-'25	9, 955	7, 034	1841-'42	2, 200	1, 042
1825-'26	5, 289	3, 922	1842-'43	208	198
1826-'27	13, 589	8, 356	1843-'44	2, 500	1, 176
1827-'28	2, 684	1, 495	1844-'45	100	70
1828-'29	....	....	1845-'46	90	90
1829-'30	1, 140	827	1846-'47	25	10
1830-'31	....	....	1847-'48	1, 150	1, 100
1831-'32	....	....	1848-'49	493	40
1832-'33	300	180	1849-'50	....	....
1833-'34	102	148	1850-'51	2, 740	2, 803
1834-'35	1, 031	1, 060	1851-'52	1, 079	910
1835-'36	1, 065	1, 020	1852-'53	36	37
1836-'37	....	....			

In regard to the culture and manufacture of indigo in this country, Porcher, in his work on the Resources of Southern Fields and Forests, (1869,) says that the soils best adapted are the rich, sandy loams, though it grows on most lands moderately well, provided they are not wet. The ground should be well broken, and kept light and free from grass by the plow. The nature of the manure used exerts a great influence upon the quantity and quality of the coloring principle. Those substances which act as stimulants to vegetation, such as lime, poudrette, ashes, &c., favor the growth of the plant without injuring the coloring-matter. Where barn-yard manure has been largely used a crop of grain should first be raised on the land. The seed should be mixed with ashes or sand and sown in drills 14 inches apart, four quarts of seed to the acre. In the climate of Middle Georgia the seed should be sown the 1st of April. When it first comes up it should have the grass picked out with the hand. When an inch or two high the grass between the rows should be cut out by the hoe or scraper and the soil loosened about the roots. These weedings are enough before the first cutting, which should commence as soon as the plant throws out the bloom. It is so easily injured by the sun after being cut that the operation should be commenced and end in the afternoon. After cutting with the reap-hook it is put under the shed until it can be put in the vats. In Georgia two cuttings yielded sixty pounds of indigo to an acre, provided the roots were not injured in the first cutting, which, at three acres to the hand, would be one hundred and eighty pounds.

It is said that among the Arab cultivators in Egypt and Morocco the seed is sown only once in seven years, and that two crops a year are obtained. Among these people the process of manufacturing or extricating the coloring matter from the plant is given as follows:

Three wooden vats are provided and so placed at different levels as that the contents of the first can be readily transferred to the second, and again from that to the third. The upper vessel is called the steeping vat, and in this the plants are loosely laid, in sufficient quantity to cover the bottom, and water poured over them to the depth of two or three inches. In about eighteen hours fermentation begins and the plants swell and give off large quantities of gas, which tinges the water with a lively green color. After all the coloring matter, or grain, as it is technically called, is extracted, the turbid liquor is drawn off into the second vat where it is violently agitated and beaten in order to separate the grain from the water. A great quantity of air-bubbles are driven off by this beating, and the color of the contents of the vat changes from green to deep blue. When the grain has subsided to the bottom of the vat the supernatant liquor is drawn off and the grain is discharged into the third vat, where a further subsidence and drawing off ensue, and the grain is next transferred to sacks and hung up to drain. It is then placed in wooden boxes and exposed to the air and sun until all the moisture is evaporated, when the process is completed and the indigo is packed in chests for shipment.

In the great indigo-factories of Bengal some part of the drying is effected by the agency of fire. The following process of manufacturing indigo in small quantities for domestic use is given by the Southern Agriculturist:

Cut the indigo when the under leaves begin to dry, and while the dew is on them in the morning; put them in a barrel and fill this with rain-water, and place weights on to keep it under water; when bubbles begin to form on the top and the water begins to look of a reddish color, it is soaked enough and must be taken out, taking care to wring and squeeze the leaves well, so as to obtain all the strength of the plant; it must then be churned (which may be done by means of a tolerably open basket with a handle to raise it up and down) until the liquor is quite in a foam. To ascertain whether it is done enough, take out a spoonful in a plate and put a small quantity of *very strong lye* to it. If it curdles, the indigo is churned enough, and you must proceed to break the liquor in the barrel in the same way, by putting in the lye (which must be as strong as possible) by small quantities, and continuing to churn until it is all sufficiently curdled; care must be taken not to put in too much lye, as that will spoil it. When it curdles freely with the lye, it must be sprinkled well over the top with oil, which immediately causes the foam to subside, after which it must stand till the indigo settles to the bottom of the barrel. This may be discovered by the appearance of the water, which must be let off gradually by boring holes, first near the top and afterward lower, as it continues to settle; when the water is all let off and nothing remains but the weed, take that and put it in a bag (flannel is the best) and hang it up to drip, afterward spreading it to dry on large dishes. Take care that none of the foam, which is the strength of the weed, escapes; but if it rises too high, sprinkle oil on it.

Another local authority in the South says that the apparatus for making the indigo is inconsiderable and not expensive, for besides a pump, the whole consists only of vats and tubs of cyprus-wood, common and cheap in South Carolina.

This, of course, relates to the preparation of indigo in a small way. When large operations are to be entered upon, there is elaboration which requires capital. Dr. Wagner, in his Hand-book of Chemical Technology, (translation from the German, New York: D. Appleton & Co., 1872,) describes the process of eliminating the coloring matter, and the necessary apparatus, at considerable length. A factory is erected which is "fitted with large water-tanks, filtering apparatus, presses, a cauldron, drying-room, and, lastly, with fifteen to twenty tanks of brick-work laid in hydraulic cement and plastered inside with the same material. Into these tanks the branches, twigs, and the leaves are placed, and water is run in, care being taken to force the green plants down under the water by the aid of stout wooden balks wedged tight against the sides of the wooden tanks, &c." Having described in detail the process of elimination, the author says the exhausted plants are used for a manure, for although the boughs on being planted in the soil would again grow, they would not yield either in quality or quantity enough to pay the expenses of culture.

Fownes, in his Manual of Elementary Chemistry, London, 1873, eleventh edition, says that when the leaves of the indigo-plant are placed in a vessel of water and allowed to ferment, a yellow substance is dissolved out, which by contact of air becomes deep blue and insoluble, and finally precipitates. This, washed and carefully dried, constitutes the indigo of commerce. Nor is fermentation essential, as a mere infusion of the plant in hot water deposits indigo by standing in the air.

Mr. John F. D. Smyth in his "Tour of the United States," published in London in 1784, referring to the cultivation of indigo in the South at that day, said that about twenty-five hands could manage a plantation of fifty acres, and complete the manufacture of this valuable dye-stuff, besides providing their own necessary subsistence and that of the planter's family. If the land was very good each acre would yield from sixty to seventy pounds of indigo; at a medium the produce was fifty

pounds, but this was regarded by many skillful planters as a very indifferent crop.

It must be admitted that the highest named of these yields was very poor indeed, in view of Loudon's assertion referred to above, that in the Indies seventeen negroes managing twenty acres could produce five hundred pounds in twelve months. It may tell a story of unthrifty and unskilled management on the part of the earlier planters; and yet the indigo-crop of that day was a very important one in the country. Certainly in the light of the progress made in agriculture since that time, covering its methods of planting, fertilizing, garnering, and embracing labor-saving machinery of great diversity, greater things might confidently be expected.

A correspondent of Clinch County, Georgia, recently sent to the Department a specimen of the indigo-plant which grows wild in that section and in great abundance. On examination it proves to be *Indigofera anil*, before referred to in this article as the variety chiefly grown in the West Indies, yielding one of the valuable dyes of commerce. In Georgia it is cultivated only for immediate uses. It is there prepared as follows: The plant is gathered while in full blossom, viz: the stalk and its branches; it is then placed in a barrel or trough of cold water, where it is left to soak until the ends of the stalks turn a reddish color, and is then pounded, or "churned," with a ladle or paddle until it foams like soap-suds, then left to settle. The sediment at the bottom is the indigo, or coloring matter.

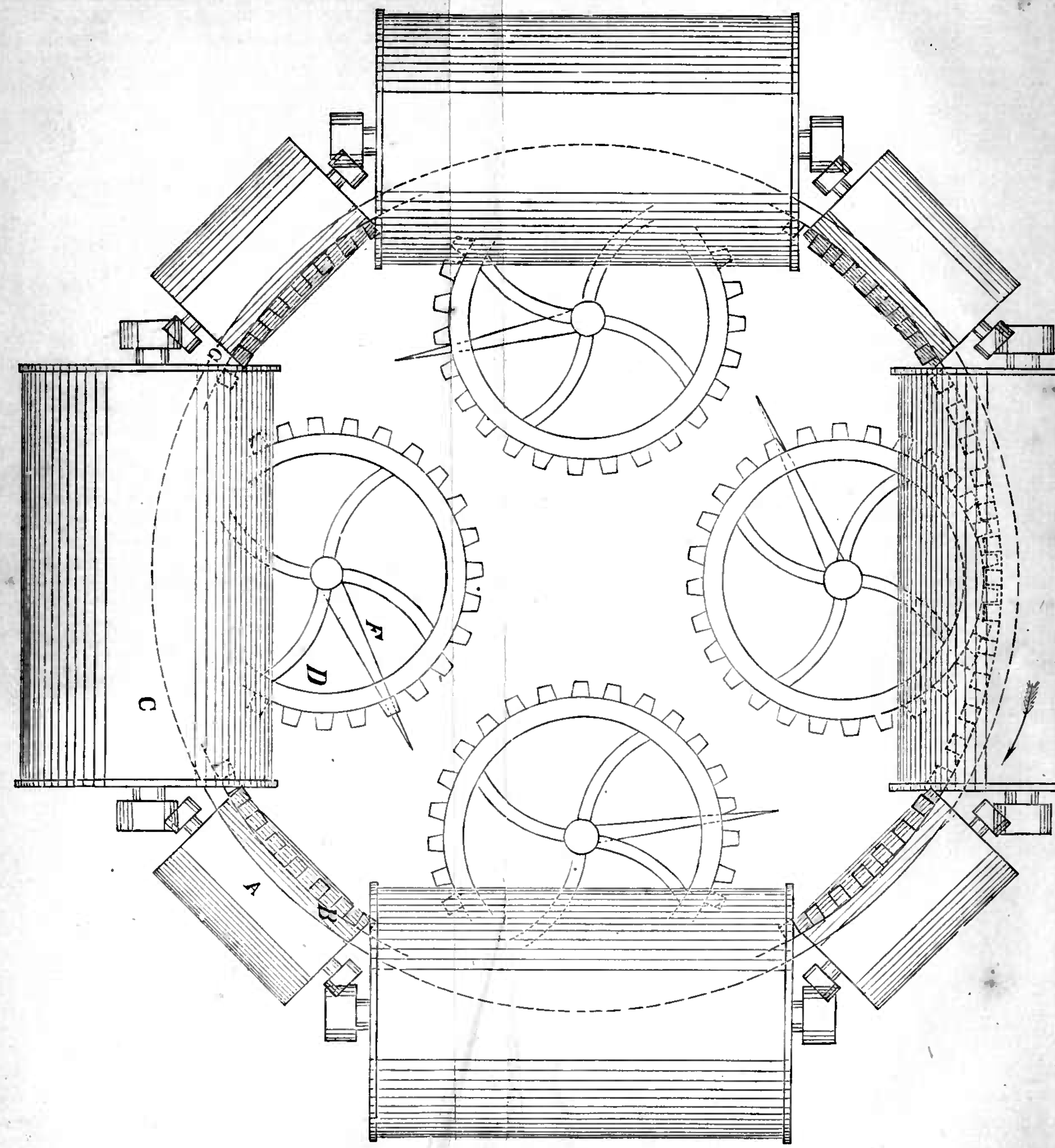
In the county of Orangeburgh, S.C., there are six indigo-farms, carried on by some of the older men of the county. The plant grows luxuriantly, and is found in the woods uncultivated. The only variety cultivated is the wild indigo, (*Baptisia tinctoria*,) indigenous to the county. This is not a superior variety for cultivation for purposes of commerce, the indigo not being sufficiently deep in its blue, and in quality inferior to that produced in Georgia, referred to in the preceding paragraph. For a very comprehensive statement of the condition of indigo cultivation in this district, and for a comparison of the profits derived from it as compared with those from cotton-growing, the Department is indebted to Mr. Paul S. Felder, of Orangeburgh. He says:

The wild indigo (*Baptisia tinctoria*) is the favorite in this county for the manufacture of indigo for market. It grows from the seed, (which is heavier than that of other varieties,) and, once planted, annually comes up in the spring from the roots, its vigor increasing until, on account of the annual cuttings and removal of all vegetation, the ground is entirely exhausted. This happens in from six to ten years. No fence is needed to inclose it, as stock will not interfere with or eat it. Those who have planted it here never use manure of any kind, nor ever plow it. The hoe alone is used to keep down weeds and grass after each cutting. Very soon the plant from the strong roots puts out vigorous sprouts, which shade the ground and keep down other growth. Hence its cultivation is very easy and the cost small. The greatest labor is in cutting, which is done with the common reap-hook and is a very slow process. This part of the work must be done before the dew dries off the plant, and the plant is transferred to the vat before it wilts. For this reason more hands are required than otherwise would be necessary. If a light reaper that could be pushed by hand were manufactured, the expense would be greatly lessened. Manual labor is necessary because the plants are put in new land, and there are always too many stumps to allow the work of horses. With the use of a mower and the application of fertilizers, I think, the business might be made one of great profit. As it is, indigo pays better than cotton, although cotton cultivation has almost quite superseded it. One cause of this supersession is that indigo cultivation is considered an unhealthy business. The land best adapted to indigo is a sandy soil, the poorer parts of a tract, hence when it ceases to yield this plant it is fit for nothing else. The indigo is cut as long as it will sprout, and coming up from the root it sprouts as long as there is any nutriment in the ground. After the fields are abandoned grass comes up, and in a few years of accumulation of vegetable matter indigo may grow luxuriantly again, but too much scattered to be profitable for gathering.

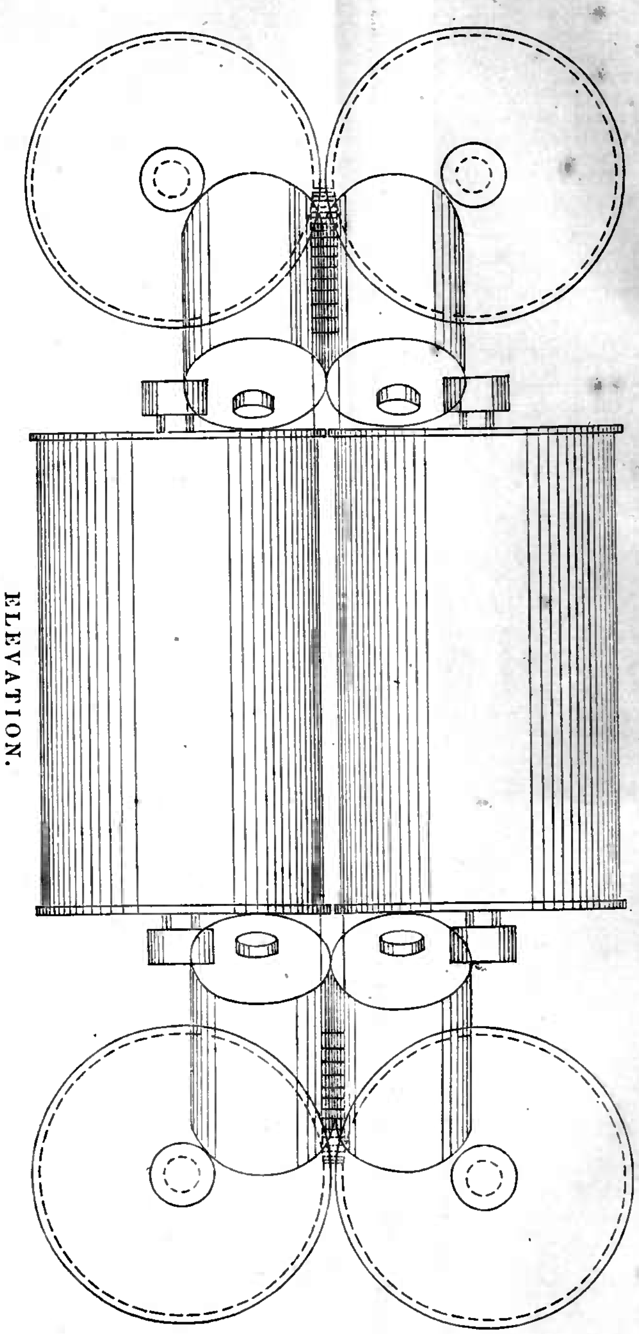
DECORTICATOR FOR RAMIE, JUTE, HEMP, FLAX, AND OTHER TEXTILES IN GREEN STALKS.

INVENTED BY EMILE LEFRANC, NEW ORLEANS, LA., DECEMBER, 1873.

N. B.—The opening G should be wider.



PLAN.



ELEVATION.

Scale, ¼ inch per foot.

The machine is quadruple in its action. It consists in four feeders and four cleaners, inside of which revolves, horizontally, a large cogged wheel acting as a circular carrier. It brings the crushed plant in, and draws it from, the revolving cleaners, as follows:

A, crushing rollers, through which the green stalks are passed, and placed on the rim of the large cogged wheel or circular carrier.

B, rim of the carrier, on which hangs the flattened plant coming from the rollers.

C, revolving cleaners, furnished with knives attracting the plant while it is drawn by the circular motion of the carrier.

D, small cog-wheels in contact with the large wheels, and keeping the plant under pressure.

F, projecting bar to direct the fiber into the cleaners.

G, opening to take off the cleaned fiber.

Comparing the profits of indigo and cotton cultivation respectively, I select the number of five hands, because less than that number, with the rude implements used, cannot manage an indigo-farm. On a cotton-farm provisions for teams and hands and three bales of cotton to the hand is good planting; it is more frequently fallen short of than reached. The following is the profit arising from the labor of five hands in the cotton-field:

Wages of 5 hands, 12 months	$500	
Fertilizers	150	
Interest on purchase of teams, tolls, &c.	50	
		$700
Cotton now worth 15 cents per pound in Charleston, less freight and commission, 3 cents per pound, 15 bales, 400 pounds per bale, at 13 cents		840
Profit on cotton		140

Five hands on an indigo-farm will make provisions and 250 pounds of indigo per hand.

1,250 pounds indigo, at 75 cents per pound		937 50
Expenses: wages, 5 hands 5 months	$250	
Interest on teams, &c	50	
		300 00
Profit on indigo		637 50

Mr. Felder adds that indigo-lands can be bought at from 50 cents to $1 per acre. His statement throws considerable light upon the possibilities of indigo cultivation carried on with knowledge. As is shown in this article, indigo requires good land, abundant and rich manuring, and careful manipulation. The choice of a good variety for cultivation is a condition-precedent, of course. Yet we here see that lands, considered as useless for any other purpose, sandy soils, lands full of stumps, without manures, without any cultivation whatever, yield a profit even above cotton that is simply enormous. At the same time, no implements except the hoe and the reap-hook are employed, and a variety of the indigo-bearing plants, ranking low for quality, is relied upon for a product. The indigo of Bengal commands $2.30 to $2.50 per pound; that of Guatemala, $1.90 to $2.00; while that of South Carolina sells for 75 cents per pound. It would seem possible that if enterprise and skill were turned toward the improvement of the methods of the cultivation and maufacture of indigo, as in the case of other valuable products; if, for example, lands for the purpose were raised to the proper tilth, and kept up to it as nearly as may be; if machinery were provided for the more expeditious cutting of the leaves, and for the more certain expression of the coloring matter, requiring less labor and yielding more certain and assured results; if, in a word, knowledge, backed by capital, were employed in the industry, the production of indigo might possibly again be made remunerative on southern fields.

CULTURE OF RAMIE AND JUTE.

Within the last few years the Agricultural Department has taken much interest in the subject of ramie and jute, the seeds of which were originally introduced by it into the country and extensively distributed in the Southern States. The effect of this has been to make the impression that the cultivation of these plants is about to become one of the most important industries, and especially valuable because it will give a profitable employment to the planters and lands of a portion of the country where a larger production of cotton so lessens the price as to make any new production desirable.

Experiments lately made in the State of Louisiana in the cultivation and preparation of both ramie and jute seem to settle the question that it is both practicable and profitable. The Department has sought to gather all the information which can be gained on the subject; and, at its instance, a treatise has been prepared by Emile Lefranc, of the "Southern Ramie-Planting Association," whose experience, both in the cultivation of these plants and preparation of their fibers, enables him to speak confidently of the success that company has met with.

RAMIE.

BY EMILE LEFRANC.

At last this remarkable textile plant is enabled to leave the harassing and expensive phase of experimental struggle; it can now safely enter into the broad and rich sphere of productive cultivation, and open a new source of prosperity in the industrial area of the New World.

It has just been delivered from the heavy impediments which have, so far, prevented its useful development.

After having been the objecs of years of laborious and costly efforts in many quarters, and by many searching minds, the arduous problem of separating economically that fine textile from its green coating has been satisfactorily solved in New Orleans. The difficulty of applying the proper treatment to the fiber is now radically removed by the completion of an improved decorticating-machine, patented in 1870, and finally perfected in 1873, that is to say, a few months ago.

The machine was put publicly in operation last September, on the farm of the "Southern Ramie-Planting Association of New Orleans."

It has worked for weeks in the regular decortication of ramie and jute in green stalks. Undeniable evidence has been there furnished of the long sought-for discovery of a successful method for setting free the rich fiber from its tenacious bark and pithy envelope.

Introduced into Louisiana toward the fall of 1867, the ramie has had ample time to prove its vitality and toughness as a perennial growth. With little or no care it has thriven alone since then, and wherever attention has been given to it, its propagation has been considerable. In some rich and elevated soils the plant has stood and propagated without the least cultivation for the last six years. The stems die in winter, and multitudes of others shoot forth every spring. Where the bushes are regularly cut three or four times a year, the more vigorous and luxuriant is the growth. All these facts sufficiently prove the perennial and hardy vitality of the plant, as also its adaptability to our soil, and the congeniality of our climate. Therefore the agricultural problems and the questions of acclimation are also solved and settled. If the ramie industry did not unfold sooner the advantage of the plant, it was solely on account of the unprofitable or inefficient methods of extracting the fiber. When first introduced on this continent, the treatment of the ramie-plant was erroneously assimilated to that of the nettle family. The universal opinion was that it should be treated like jute, flax, hemp, and other textiles of the cannabis variety, which are disintegrated lengthwise from the stems by the simple process of water fermentation.

The error was soon discovered. Ramie-fiber admits of no rotting action on the stalks. Steeped and fermented in water or exposed to the air, it is decomposed and reduced to a short and weak fiber, saturated with tannic acid and spotted with tanbark. Moreover the process is tedious and anti-economical. It has been found that the envelope of the ramie-fiber contains some sulphuric and carbonic elements, which dissolve the joints of the cellulose when the stem is subjected to the acetic degree of fermentation or rotting. Then, some chemists resorted to the process of neutralizing those dissolving elements by means of an acidulated bath for the plants.

But those different systems were of no avail, because they required the additional intervention of machinery to break and hackle the filament, which was otherwise more or less injured in its quality by the unnatural treatment to which it was subjected. In face of the despotic exigencies of economy in labor, and the absolute necessity of a large production, none of those methods was practicable.

But another road lay open to logical and searching intellects. They were guided by the investigation of the following points:

First. What is the process of the Chinese, who for centuries have monopolized the ramie-fiber trade? Their process consists in stripping the ramie-plant and scraping the bark containing the filament.

Second. Why do they not proceed by rotting the stalks as they do for their other long textiles? Because they know that the nature of the ramie-plant does not permit it; they are aware that this fine fiber can only be obtained by separating first the injurious bark, which, being removed, permits the ordinary process of rotting and bleaching on the uncoated and free filament.

The question being so propounded and answered, there was but one way to solve the problem—to construct a machine capable of doing what the Chinese do by hand. They skin the stalk and clean the outer bark off with a knife, and each hand obtains in this manner one or two pounds per day of a marketable raw product. A machine had then to be invented that would supply daily one thousand pounds of a similar product. Such was the task, and it has been accomplished.

But inventions of that kind, with no precedent, no basis in existing machinery, are not the work of a day; they are the result of years of persistent experimentation and concentrated thought.

Sound and useful contrivances have ever been of slow growth. It seems that a certain experimental and painful stage is the necessary tribute paid in advance to the benefits of progress.

Practical persons familiar with the treatment of textiles know the impossibility of cleaning thoroughly any fiber, dried or green, by the continuous action of machinery. Either with drums or beaters the cleaning instruments cannot turn out the filament without a certain quantum of chaff and other refuse entangled in the fiber. All experiments on this point have failed, and proved the insuperable difficulty of expelling by continuity of friction all the particles of pith that have penetrated into the fiber. It is only through a scraping process, acting in a backward and forward direction, that a perfect cleaning can be obtained.

The contrivance that cleans ramie, and furnishes a product similar to that of China, is founded on that true principle, as follows:

Revolving cleaners, provided with a peculiar sort of knives, receive gradually, by means of a circular carrier, bunches of stems, which are doubled down and hooked in the middle. The carrier withdraws them from the rotary action of the cleaners, and delivers them in the form of clear ribbons, of a light yellow color, as fine as the imported China-grass.

That crude ramie-staple is worth from £65 to £70 per ton in Europe, but American manufacturers offer 20 or 25 cents a pound for it, provided a large supply be secured. On account of the aforesaid difficulty of decortication by machinery, it has hitherto been impossible to comply with this condition, and consequently the cultivation of the plant has remained stationary in America. This impediment is now about to disappear, and a flourishing trade will, no doubt, be soon inaugurated. Then there will be no reason for confining the value of the fiber to what it is worth in its crude condition. Properly ungummed and bleached by the process hereafter described, ramie-fiber acquired a double and triple market value. Then, if dressed and combed smoothly, it has the beauty and value of a lustrous staple which is classed next to silk for strength and brilliancy. The tissues called "Japan silk," "Canton goods," "grass-cloth," "Nankin linen," and many other varieties of dry-goods, are generally made of ramie material, more or less mixed with other fiber.

English manufacturers have monopolized the ramie or China-grass trade in Europe and America, and kept somewhat secret the process of finishing and weaving the fiber. Almost all the dress-goods—mixed with brilliant materials and imitating silk fabrics—are made in part of ramie. Leeds and Bradford are the principal manufacturing centers that use that staple as a substitute for silk in many sorts of goods. It is a common error to consider ramie as a substitute for cotton.

None of the Bohemaria or Urtica grasses have the necessary requirements for dethroning that useful king. The effect produced by the ramie-fiber is cooling rather than warming, and it cannot for that reason take the place of the indispensable cotton-staple. Flax will, perhaps, feel its competing influence, because the ramie-tow, called cottonized ramie, enters into the manufacture of fine linen and cambric imitations. But the long ramie-staple has a higher destiny; it is in the rich domains of the silk trade that it will predominate as an ally more or less officially recognized. Like certain sorts of wines, such as champagne, port, sherry, Madeira, and others, whose consumption exceeds considerably the genuine produce, the so-called silk products greatly surpass in volume the actual amount of silk that could be obtained from all the cocoons of the whole world. Evidently there is some precious substitute more or less openly introduced into the pretended silk-stock. What is this contraband material? Lancashire and Lyons manufacturers could probably answer the query. But, resorting to no such indiscreet question, we can derive some light and information from the following figures of the eastern exporting trade. In a pamphlet recently published on the subject of ramie by Baron Jean de Bray, we find that the exp[illegible] of China-grass from Shanghai alone amounted in 1865 to 3,240,000 kilograms—about seven millions of pounds. It is reasonable to infer that this exportation has increased ever since, and that India and Japan have furnished also to the outside trade a certain

share of the staple. Whatever may be the consumption now, it is certain that the demand for this fine article will for a long period exceed the supply. The limited surplus over and above the home consumption of the crowded populations of Asiatic countries has been a drawback to the diffusion of ramie in other parts of the world. The cleaning process of the Chinese permits to each hand an average of only 1½ pounds a day; hence the limited production.

It is a well-known fact that if American manufacturers have not yet displayed their usual enterprising spirit and ingenuity by availing themselves of the advantages without number offered by the ramie, it is because they could not secure a regular supply of the fiber. But the decortication of the plant being now easy and economical, its cultivation will receive its due development, and permit our industrial institutions to check the foreign monopoly of ramie goods. We have now on hand all the necessary elements for the rapid progress of its cultivation and production; abundance of plants and roots as acclimated seed; lands and climate perfectly suitable; practical knowledge derived from six years of experiment; and, finally, the mechanical means of harvesting this valuable product.

Having thus exhibited the actual standing of ramie as the element of new branches of manufactures on this continent, and demonstrated that, instead of being abandoned as a failure, which many thought it was, it has silently prepared its way to success, we deem it proper to state briefly the past status of the plant, and the use made of it by its original producers.

If ramie is a novelty for the New World, it has been in use from remote antiquity in the Old. Japan, China, India, and almost all the islands of the East have, for centuries, made of it the basis of their home fabrics, and an object of foreign trade. The Greeks and the Romans used, as silk clothing, ramie goods imported from the countries of Southern Asia. Virgil mentions the fact, and admires those rich tissues, in his Georgics. He calls them the brilliant product of the silk countries of the East. Several learned Jesuits, when missionaries in Japan and China, discovered that "this brilliant product," so admired by the Roman poet, was the nettle-fiber called "kara" in Sapan, "ma," or "chu-ma," in China, "rhea" in the East Indias, and "ramah," or "ramie" in Java. All these denominations in the languages of the countries producing the plant have some meaning in regard to the varieties in the nettle family. The generic name of the plant is "Urtica," of the Bohemaria tribe. But in its numerous varieties there are different qualities classed under two principal types: *Urtica nivea* (the English China-grass) and *Urtica utilis*, or *tenacissima*, which is the *ramie*. The latter is the better of the two. We have both varieties in Louisiana, and we can confirm Dr. Decaisne's assertion of the superiority of ramie over China-grass. Thus *Urtica nivea*, with the leaves green on one side and silvery on the other, is inferior both in productiveness and in quality. Its fiber remains greenish, stiff, and brittle. It is the reverse with the ramie, or *Urtica tenacissima.* It is partly for that reason that the English government of East India promotes by all possible means the production of that variety in Hindostan. It is named *rhea* there and ramie here. The Asiatic etymology of the two names corresponds logically to the meaning of "high branches."

Roxburgh in England, Decaisne in France, and the Department of Agriculture in America are the principal introducers of the plant into the scientific spheres of their respective countries. They have personally verified the industrial value of ramie as the genuine kind of Bohemaria, and recommended its adoption to agriculturists. Decaisne, professor of the Museum of Natural History in Paris, has published a notice in which he traces the use of the textile in Europe as far back as the seventh century. "Russia," he says, "received it from the Tartar and the Chinese as damask silk; Holland received it from her Asiatic establishments, and trades still with it, under the name of *nettledocok;* England, under Queen Elizabeth, learned from the botanist Lobel the value of the article, and has since labored to monopolize its trade throughout the civilized world.

In Europe, especially in France, new ideas and discoveries are promptly investigated and sifted out by scientific volunteers laboring ardently to keep their minds in activity, or to have the pleasure and the honor of contributing to the progress and the welfare of mankind. They do there in theory what our Department of Agriculture does here in practice. They study, think, and write on any agitated subject, and send the result of their mental efforts to some academy or institute, whence it is publicly disseminated throughout the world.

The ramie question has been turned over and over again, for years, by writers on industry and economy. Numerous memoirs, pamphlets, and books have appeared in the wake of the learned Roxburgh and Decaisne. But few of those publications possess the tangibility of accurate facts and of practical knowledge. The majority are merely vague repetitions of old reports, and convey no instruction of a solid nature. One of the rare good treatises on the matter is that of Ramon de la Sagra, member of the French Institute. It has been published in the Bulletin de la Société d'Acclimation of 1869, which is similar in its object to the monthly report of the United States Department of Agriculture. That treatise is a clear and reliable exposition of the

Chinese methods employed in the cultivation and treatment of the plant, but the writer concludes, in harmony with all those that are properly enlightened on the points in question, that the profitable cultivation of ramie is doubtful in European latitudes, or, at all events, not to be attempted until the cleaning can be performed by efficient machinery. In the Union the plant has a wide field and an ample margin in regard to the latitudes congenial to its growth. The Gulf States and California have in that respect the requisite qualities, particularly Louisiana, where the plant was first introduced from Mexico, in 1867, and subjected since to various tests. To two persons is due the credit of its introduction into the United States, viz., Monsieur Ernest Godeaux, in that year consul of France in New Orleans, and Benito Roezl, a Bohemian botanist, once a resident of Santa Comapan, in Mexico. M. Godeaux, who was consul at Shanghai before coming to New Orleans, had brought from China fine white clothing made of "ma." It was remarked and admired by every one for its various qualities. Having observed that the latitude and soil of Louisiana could not be uncongenial to the plant, M. Godeaux ordered some ramie-seed from China. But it failed to come in proper condition. By a curious coincidence Roezl arrived at that time from Vera Cruz with a lot of ramie-roots for sale. He had also a few plants growing in flower-pots. M. Godeaux identified and recommended the plant as being the same he had attempted to introduce into Louisiana as a profitable article of cultivation. The Department of Agriculture, then superintended by General Horace Capron, also recognized the identity of that Bohemaria and officially proclaimed its merits, as the Hon. Frederick Watts now does in regard to jute.

The New Orleans press, the Picayune, the Times, the Bee, the Renaissance Louisianaise, &c., studied elaborately the value and utilization of this textile, and recommended its adoption. Roezl sold his roots in small quantities to numerous experimenters, and the initiation of the plant was effected with varied success in different quarters of Louisiana, Mississippi, Texas, South Carolina, Georgia, Alabama, &c. Thus a few hundreds of sickly ratoons, transplanted from Mexico, where a dozen roots had been previously imported from Java, rapidly produced millions of plants in these States. But the vicissitudes of the country, the want of efficient machinery, as also insufficient care and attention, caused the decay of a great portion of this first growth. Louisiana is probably the only spot where the propagation of the plant was maintained. All sorts of experiments on the various points to be studied made the writer of this memoir familiar with the ramie cultivation and its requirements. The successful cultivation of the ramie is not exactly an easy task, as many suppose it to be, nor can the plant adapt itself to any kind of soil indiscriminately, as it has been reported. Experience has demonstrated that a durable stand requires a judicious choice of land and situation, also intelligent and attentive labor at the outset. Bearing in mind that ramie is a perennial growth of great productiveness, which can last for years and years, it will logically be admitted that a selected and well-prepared soil is indispensable to secure the benefit of frequent cuttings and a lengthened stand. Therefore the observation of the following rules will be absolutely necessary for the cultivation of ramie, and for drawing from the rich plant all it can yield:

First. Whether for nursery purposes or for cultivation, the land must be sufficiently elevated to receive the benefit of natural drainage, because the roots will not live long in a watery bottom.

Secondly. The soil must be deep, rich, light, and moist as the sandy alluvia of Louisiana. Manure supplies the defects in some lands in these respects.

Thirdly. The field must be thoroughly cleared of weeds, plowed twice to the depth of 8 or 10 inches if possible, harrowed as much as a thorough pulverizing requires, and carefully drained by discriminate lines of ditches. Water must not be allowed to stand in the rows of the plant.

The land being thus prepared, planting becomes easy and promising. December, January, and February are the best months in which to plant. Roots, ratoons, and rooted layers are the only available seed. They are generally 4 or 5 inches long, carefully cut, not torn, from the mother-plant. The dusty seed produced by the ramie-stalks in the fall can be sown, but it is so delicate and requires so much care during the period of germination and growth that it seldom succeeds in open land. The regular germinating power of that seed is also questionable. The Department of Agriculture vainly tried, a few years ago, to diffuse this seminal cultivation by distributing imported seed, which never germinated.

In the presence of these difficulties, and of the sure propagation obtained from fractional roots, sowing has been abandoned and replanting adopted as follows:

Furrows 5 or 6 inches deep and 5 feet apart are opened with the plow. The roots are laid lengthwise in the middle, close in succession if a thick stand of crop is desired, but placed at intervals if nursery propagation is the object in view.

The first mode will absorb 3,000 roots per acre, but will save the labor of often filling the stand by propagation. The second mode will spare three-fourths of that amount of roots, but will impose the obligation of multiplying by layers. Being placed in the furrow closely, or at intervals, the roots are carefully covered with the hoe. Pulverized

earth and manure spread over the roots insure an early and luxuriant growth in the spring. When the shoots have attained a foot in height they are hilled up like potatoes, corn, and all other plants that require good footing and protection from the fermenting effect of stagnant water. The intervals between the rows being deepened by the hilling have also a draining influence, which can be rendered still more effective by ditches dug across from distance to distance, say 15 feet.

Good crops are obtained by thickening the stands. The stems are then abundant, fine, straight, and rich in fiber. Close panting is then necessary, inasmuch as it prevents the objectionable branching of the stalks. Crooked and branchy ramie is unfit for mechanical decortication; it causes waste and yields an inferior quality of fiber. The period at which the plant is ripe for cutting is indicated by a brownish tinge at the foot of the stems. At that early stage the plant, though greenish, yields a fine and abundant filament; it also produces three or four crops, according to soil and climate. The first cutting may be unprofitable on account of the irregularity and sparseness of the growth; but if the stand is well razeed and manured over the stubbles the ensuing cuttings will be productive. For that purpose the field must be kept clear of grass until the growth be sufficiently dense to expel the parasites by its shade. That necessary density is obtained by means of the important laying process. This consists in bending down, right and left along the growing stand, the highest switches, and in covering them with earth up to the tender tip, which must not be smothered. One of the causes of the perennity and of the vigor of the plant is the nourishment it draws from the agencies of the atmosphere. Consequently the leaves of the layers should never be buried under ground. When properly performed, laying is very profitable; it creates an abundance of new roots, and fills up rapidly the voids of the stand.

After two years the plants may be so thick as to spread out in the rows. Then the plow or the stubble-cutter has to chop in a line, on one side, the projecting ratoons. If well executed this operation leads to notable advantages:

First. It extracts roots or fractional plants suitable for the extension of the cultivation elsewhere.

Secondly. It maintains, as a pruning, a vigorous life and develops a luxuriant growth in the stand.

Thirdly. If always applied on the same side of the row, this sort of stubble-cutting has the remarkable advantage of removing gradually the growth toward the unoccupied land in the intervals, and of pushing it into a new position without disturbance.

That slow rotation preserves the soil from rapid exhaustion, and the ramie from decay, through the accumulation of roots under ground. Of course this lateral plowing will not prevent the opposite row from receiving the benefit of hoeing after each crop. Experiments made in Louisiana have demonstrated the efficiency of that method; to which are due the preservation and propagation of the plant in that State, while it has been destroyed in other sections for want of similar care.

It is through such judicious methods that the old land of China has preserved sufficient fertility to produce constantly the ramie for many centuries. After each cutting Chinese planters plow on one side and make cleanly the stand; then they cover it with a thick coat of manure. That maintains the moisture and fertility of the soil, and, at the same time, preserves the plant from excessive heat or extreme cold. That protective system permits in winter ramie cultivation in latitudes corresponding to those of Maryland and Virginia. It could even be undertaken farther north by another Chinese application.

In some cold regions of the northwestern parts of the Celestial Empire China-grass is cultivated like potatoes. Planters dig up the stand every fall, after the last cutting, and store the roots in cellars to replant them in the spring; yet they generally obtain two crops by that unfavorable process.

Let us now close this notice with a descripition of the harvesting operations. As we have already said, the cutting must commence when the stalks, in dense bushes, become brownish at about a foot above the ground.

The American Mower, World No. 1, with the new short blades, will now ramie easily and rapidly. The reaper will permit the stems to be gathered in sheaves like wheat. Men and women walking behind the mower tie them and equalize the ends. Thus they build them in stacks from distance to distance on the ground. After a few days the leaves wither and fall under the handling and the shaking they undergo while they are being carried to the machine. Ramie may remain cut from eight to fifteen days, according as the weather is dry or damp, before it is decorticated.

There is also between the first and last degree of maturity a space of time which leaves a sufficient margin for the harvesting of 50 acres per machine. The yield of ramie-fiber per acre varies according to the density of the growth. A plantation with regular thick stands will produce from 400 to 500 pounds of crude fiber per acre at each cutting.

The process of decortication is simple and easy. The bunches coming from the field, with as few leaves as possible, are placed one by one in succession in the compressing aperture of the feeder of an endless circular carrier. The stalks brought under the

influence of the attractive rotation of cleaners, revolving with great velocity, are crushed at their entry and scraped at their exit by the peculiar effect of the horizontal carrier, which turns out the cleaned fiber on the opposite side of the feeder.

The yield of the machine will be in proportion to its size and power. The cleaning is incessant if the machine is fed constantly by a quick handling. Its principle offers the facility of such an expansion that the apparatus can be made large enough to clean one ton of fiber per day with a twenty-horse motive-power. It is not only to ramie, but also to jute, flax, hemp, and all strong textiles, in green plants, that this new machine can be successfully applied. It is demonstrated by theory and practice that the textiles extracted in a green state retain all the natural qualities of strength and color, which lose always 50 per cent. by the ordinary process of rotting in stalks. The avoiding of that loss is one of the great advantages of the machine, besides the important economy in labor. Now comes the disintegration of the decorticated fiber.

The yellowish ribbons produced from the plant engaged in the machine are the crude fibers. Albumen keeps them undivided, but being dried in the shade they acquire in that state a marketable value, which will double and triple by subjecting the filament to the bleaching treatment. However, ramie planters need not push so far as the industrial preparation of the product, inasmuch as they can sell it in its raw condition to bleachers and manufacturers, as brown sugar is sold to the refiners. But should they desire to bleach and refine the article, they could do it by the appliance of the ordinary process in use for flax-bleaching. The best method is that of Betholloet, which has been the most extensively used. It consists in first steeping the fibers or vegetable tissues in boiling water, and then in rinsing them in a copious supply of water in order to disengage them from soluble matter. When the water has entirely dropped off they are plunged into a bath of alkaline lye, which is raised to the boiling-point; they are then immersed in a solution of hypochlorite of lime or an alkaline hypochlorite. The tissues are washed in a copious supply of water, and then immersed in water acidulated by sulphuric acid; washed with soap and water; then rinsed in water and dried. Now, much labor is spared by bringing the chlorite into immediate contact with the fibers washed in hot water and still damp, or by plunging them into a bath saturated with chlorate.

In conclusion, the ramie cultivation for southern planters and the application of the machine to the operations of the western hemp and flax-growers deserve in every respect the most serious attention. They contain undoubtedly some elements of beneficial improvement.

However, there may be one objection to ramie enterprise in the present financial embarrassment of the country. It lies in the capital required to start a regular plantation. The root-seed costs from \$20 to \$25 a thousand, and at least 3,000 roots are required for each acre.

That condition may not be accessible to many. At this juncture we have another new, profitable, and cheaper industry to recommend as being within the reach of the impoverished millions of our planting districts. That is the cultivation of *jute,* so warmly advocated during the last few years by our worthy Department of Agriculture. The following notice on the subject of jute will be, it is expected, as the above on ramie, of some advantage to the national interests of the country.

JUTE.

Jute (*Corchorus capsularis*) is a filamentous plant of the *Hibiscus-Malvacea* family. It is a native of Hindostan, and has been used for many years in the textile fabrics of Asia. Its importance as an exportable product dates principally from the cotton crisis created by the war of secession. Then the British trade took advantage of the cotton scarcity to develop the resources of jute as a cheap staple applicable in many European fabrics.

It was largely imported, brought forward as an auxiliary to the existing staples, and introduced into various spun goods. Though it has been proved unfit to take the place of cotton, the numerous experiments then made through necessity have considerably enlarged the area of jute consumption. Millions of bales are now imported and used where only thousands were employed before. It is mixed with other fibers, as wool, flax, hemp, cotton, &c., and causes the remarkable cheapness of certain tissues. A more direct and extensive use to which this long fiber has been put is in the ground of carpets, in oil-carpetings, twines, cordage, sacks, bagging, &c.

The great center of jute specialties is Dundee, (Scotland.) There nearly one hundred mills, occupying thousands of hands, work the article into various goods. All over Europe jute is applied in numerous products. Of late years France has considerably increased her consumption of jute. The assessment of the additional tax on imported textiles amounts for jute only to over 200,000 francs. Other countries con-

sume it in proportion. England, whose consumption of the article exceeds that of all other countries, has the monopoly of the product through her eastern possessions, where she has developed its cultivation to an enormous and annually increasing extent. In order to secure for a long time to come the continuation of that important source of wealth for the national trade, the British government has forced by all possible means the extension of jute-culture, even at the risk of a breadstuff scarcity, as is testified by the present famine in Bengal.

Last year a royal commission was appointed to examine the subject of jute cultivation, and inquire into the practicability of extending the production, in order to retain in the hands of the British its exclusive supply to the world. That agricultural industry being in the power of English capital, keeping in a sort of bondage millions of Hindoo producers, jute is for England what cotton is to the United States of America—the commodity which constitutes the principal portion of the national exchange. The Old and the New World are tributaries for enormous sums to Bengal, the principal jute-producing section.

The American trade disburses every year millions of dollars in gold to pay for the manufactured and unmanufactured jute received from Bombay and Calcutta. Though some sorts of canvas are designated in market reports under the denomination of American jute-bagging, there is no jute produced in America. The first trial of a regular jute-culture has just been made in Louisiana.

Desirous of relieving his country from the heavy tribute paid in that respect to India, the Hon. Frederick Watts, Commissioner of the Department of Agriculture, has taken to heart the patriotic task of introducing jute into our agricultural industry. Having obtained from Congress an appropriation for the purchase of some seed from India, Mr. Watts has distributed that seed in the Southern States, and acquired the certainty that the plant can grow and prosper in those having, to a certain extent, some similarity in latitude and soil to the jute districts of India.

Louisiana seems to be remarkably congenial to the plant. Experiments made there on a fair scale have demonstrated, by facts and production, the facility of making jute a very profitable object of cultivation.

The Southern Ramie-Planting Association of New Orleans has planted it two seasons in succession, and by various methods, with the view of testing the adaptability and the yield of the imported seed. It has succeeded remarkably well, and the reproduced seed has proved to be fully as good as the former, and even superior in some cases. It was so well acclimated the second year that it has grown and developed most luxuriantly in the various spots where it has been tried. In general, the domesticated seed has been more vigorous than the seed received from Calcutta. In the parishes of Saint James and Saint John Baptist that prolific plant has attained an average of 8 and 9 feet in height, with a thickness of growth similar to that of wheat; and in inferior soils around New Orleans it has furnished an average of 6 and 7 feet. That and many other facts conclusively demonstrate that jute finds itself at home in the alluvial and moist soil of Louisiana equally as well as in the old and half-exhausted lands of Hindostan.

Texas and Florida have also made successful experiments.

Before describing the mode of culture and of production applied in the experimentations made in Louisiana, let us insert a report, from a Boston merchant now residing in Calcutta, who has taken the trouble of examining the jute question. The following is what that gentleman, Mr. N. Goddard Fuller, writes on the cultivation of that plant in India:

"The quantity of jute fiber and seed produced to an acre depends greatly on the richness of the land. It is planted in Serajgunge, Naranigunge, (Dacca,) and other northeastern districts, where about four-fifths of the total crop is raised; the product is from two thousand to three thousand pounds of jute on an average; in some cases, however, as much as four thousand pounds are produced. The yield of seed is about one thousand to one thousand two hundred pounds per acre. In places, say about fifty miles around Calcutta, the production of which is called dessee, or country jute, the yield is smaller, being only about six hundred to one thousand pounds of fiber, and more seed, say one thousand five hundred to one thousand six hundred pounds per acre; but on rich, damp lands the product is almost as much as in the northeastern provinces. The dessee description was used only for local consumption until about five years ago, when shipments of it to England began, and both the shipments and production of it are increasing every year. Jute is sown broadcast, and about twenty-two to twenty-eight pounds of seed is required to an acre. In the northeastern provinces it is planted in February and March, and is cut about the end of June and beginning of July. The dessee is sown in July and August and cut in August and September. On rich land it grows and ripens quicker. In the northeastern districts, when grown on rich soil, the diameter of the stalk at the bottom is from three-fourths of an inch to one and a quarter inches, and the length from seven to ten feet, and sometimes, but rarely, longer and thicker.

"The country jute around cities is from four to seven feet long and one-half to

three-fourths of an inch in diameter. The plants are cut about three inches above the ground, excepting dowrah, which is uprooted. The butts are cut at the time of baling the jute for export to Calcutta. When the stalks are cut they have a green bark, which, after going through certain processes, become fiber; the planters cannot tell at the time of cutting the stalks whether any or how far from the bottom will be hard. The stalks are cut about a month before the seed ripens, and the poorer plants are generally let go to seed. Jute made of the plants producing seed is hard and barky; the unripe seed, cut with the stalks, is of no use. It grows best on rich, moist ground, but not on low ground. Castor-oil cake is the best for it, and next to that cow-manure, but the country planters, as the ground is naturally rich, use no manure whatever. An acre of cotton costs much more than an acre of jute. Jute and cotton do not interfere with each other in the least. Cotton grows in the northwestern provinces, Central and Southern India, while jute is raised in Bengal. The little cotton that Bengal produces, and the little jute that the cotton districts produce, are of poor quality, and only used for local consumption. For the last few years jute has been encroaching on the linseed-crop, as the same ground is suitable for both."

It was in the presence of such inciting reports, and of the encouraging counsels of the Department of Agricultuure, that experiments were earnestly made in Louisiana. The selection of the soil and the methods of planting were diversified in order to discover the best application. The most favorable and economical system sifted out of these various tests is the following:

To obtain good fiber-crops the land must be elevated, rich, moist, and well drained, as in India; to raise seed, low lands may be used, provided that favorable weather allows sowing and enables the growing plants to keep above the points of overflow. However, when the growth is fully started, water is not to be feared, so long as the tips remain above the surface of submersion.

In the first case, jute is sown broadcast; in the second, in drills five feet apart. That interval is to facilitate the branching, and, at the same time, the destruction by plowing of the tall weeds which generally occupy low lands. In both methods the soil must be as well prepared as for ramie; plowed as deep as possible in January or February, then left exposed to atmospherical influences until the planting period. That period commences with April and terminates with June, in monthly succession. To prepare for sowing a second plowing is required, and as fine a harrowing as can be effected. The "circular pulverizer," applied before the harrow, shortens the labor. Then the sowing for fiber-crop is performed broadcast with a Calhoun sower. With that instrument, costing $8 or $10, a man can sow ten acres of jute per day. The quantity of seed required for each acre is from 12 to 15 pounds. That is amply sufficient, and if the Hindoos put more in their land, there must be some accountable reason for that excess. Either the condition of their seed or of their land is inferior to that of America, or they are singularly prone to go to waste. We have repeatedly observed that, when the growth is thicker than what is allowed by the aforesaid quantum of seed, some natural destructive agent enters into the stand and thins the space to the limit demanded by the plant. This fact was verified in several spots of jute plantation in Louisiana. Therefore no advantage at all can be derived from prodigality in sowing. The equal distribution obtained by the mechanical sower may account also for the economical difference existing between us and the Hindoo planters, who, having no machinery whatever, do all their work by hand.

The ground being well tilled and the seed properly sown, on wet days if possible, the jute is left alone like wheat. No other care than that of drainage is necessary until maturity.

The cost of that first operation cannot exceed $4 per acre, if the material is adequate and the management judicious. That expense, of course, does not include the value of the seed, because, after the first outlay, planters will provide themselves with it from the low lands, or from the weak spots of the plantation. In the bottoms, when we plant in drills for seed, a subsequent plowing or two will be necessary in the intervals to neutralize the encroachments of grass. In Louisiana that labor is a necessity principally for the purpose of combating the tall weed called "wild indigo," which occupies the low grounds. That tall weed, which is also fibrous, is the only vegetable that keeps pace in growth with jute; all other plants are distanced and smothered by the shade of the corchorus.

In the field planted broadcast no parasite can resist the vigorous and absorbing influence of jute. Even the hardy and noxious gramineal plant, commonly called "coco" in Louisiana, is destroyed after two seasons of broadcast cultivation. Another peculiar advantage of jute planting is the antagonistic influence it exerts over insects, especially the lepidoptera tribe which generates the caterpillar. It having been stated in some reports of the Department of Agriculture that cotton-fields surrounded by jute-plantations were respected by the devouring worms, the director of the Ramie-Planting Association made special experiments to test the reported fact. Three different fields, planted with various sorts of cotton, were belted by jute. None of them were visited by the caterpillar, while the cotton of adjacent plantations was partly

destroyed by the insect. That protection is attributed to the above-mentioned influence hostile to insects. It was observed that flies and butterflies kept away from jute-fields, especially at the blossoming period. The peculiar odor of the flower and the bitter exudation of the leaves seem to be strongly repulsive to them, if not poisonous. So important a fact deserves to be demonstrated once more on a larger scale. It would cost but little to plant belts of jute around the regular cotton-plantations which have been heretofore invaded by these injurious insects.

The best period for cutting good crops of jute is during the stage that precedes the blossoming, or, at least, the seeding. The fiber is then fine, white, and strong. The monthly sowing graduates the maturing of the successive crops, which facilitates labor. April planting can be harvested in July, May planting in August, and June planting in September. Any late growth can be harvested in October, and even after, if no frost interferes. The plant stands green until frost dries it up; but even then it can furnish a good material for paper. The cutting operation is done with a mowing and reaping apparatus. The mower, World No. 1, easily cuts jute of the largest size and thickest stands. The albumen of the plant makes it easier to cut than dry wheat. The reaper gathering the stems, bundles are made and carried as fast as possible to the mill where the textile is rapidly separated as described in our notice on ramie. Then comes the rotting operation. As fast as the fiber is turned out by the decorticating machine it is plunged into large vats filled with pure water and left exposed to the heat of the atmosphere. Kept under at least one foot of water, the filament is disintegrated by the dissolution of the gums or resins which united it in a sort of ribbon. That process of fermentation or rotting takes about a week in summer. With care and attention to the proper degree of rotting the fiber comes out almost white, lustrous, and fine like flax. The disintegration is known to be complete when the fiber assumes a pasty character. Then the rotted hanks are withdrawn, carefully washed in clear water, and hung up to dry in the shade. Care must be taken that the filament be well covered with water during the fermenting period, because atmospherical agencies tend to communicate to it a brownish color. After a few days of good weather it is ready to be shaken and twisted for baling like other textiles. That new process of rotting the separated filament instead of whole stalks combines different profitable results—the advantages of economy in labor, in value, and in integrity of product. With this great progress in the manipulation, the India jute competition will surely be defeated if American agriculturists avail themselves of the chance offered exclusively to them at present.

The Hindoo planters cut their jute by hand, and subject it to the old system of ditch-rotting; they steep the plants in their draining canals and putrid water-pools until fermentation is generated in the bark; then they strip and wash by hand the rotted filament on each stalk. All this is done with a great loss of time and of value in the product. The various sizes of the stalks put to rot cause great inequalities in the disintegration; tips are rotted before the butt-ends, and while the former are weakened by over-rotting, the latter remain yet undivided through an insufficient action of the ferment. Hence the inferiority of India jute as a filament and the large amount of butts and other rejected parts which have to be deducted from the regular staple.

The jute-textile is naturally stronger than it is as it comes from India. The imperfect system of disintegration weakens and spoils it in the proportion of at least 50 per cent.

There is no such loss in the decortication by machinery; stripped from the green envelope, and reduced to a uniform ribbon, the fiber receives the direct and equal action of rotting ferments, without the injurious influence of excessive or of insufficient disintegration.

The Hindoo process of rotting the stalks is expensive, though it seems simple and easy. The work of manipulation is considerable, and is entirely wasted on 80 per cent. of refuse. Besides all its anti-economical drawbacks, it has the great inconvenience of infusing into the fiber the tannic coloring of the bark. The brown tinge with which it is permeated depreciates considerably the staple; it prevents easy bleaching and mixing in white and colored goods.

Fortunately for the United States, all these difficulties are removed by the mechanical decortication applied from ramie to jute. The decorticating-machine has operated publicly on the two plants and demonstrated the facts above stated.

Having tested the yield by the decortication of several acres, and verified in various manners the practicability of making this culture an abundant source of profit, the experimenters have purposely ceased cutting in order to save as much seed as possible for future development.

Samples of the fiber have been sent to different manufacturers, who have reported most favorably. Cordage made in New Orleans with the material has been considered superior to any made of the ordinary stock. The raw filament, produced directly by decortication, is already a marketable material. Extracted from young plants, that is to say, plants not yet in blossom, it makes an excellent strong stock for rope. When it becomes appreciated by use it may be classed as valuable as Sisal or Manila hemp.

No doubt it will, sooner or later, be adopted in company with, if not in the place of, the imported fiber. It is a well-known fact that fiber obtained from its green stem is naturally strong and durable. That explains the qualities of the raw article, inasmuch as we, by our system, can rot it to the degree required for the purpose in view.

The long, soft staple made from it by water-rotting is remarkable in every sense. It has been pronounced equivalent to Italian hemp for many purposes, especially for packing yarns. As it can be thoroughly bleached and mixed with the other staples, it will soon exceed the value of the best India jute. Ropes made for home consumption of the two sorts—the raw and the retted—have been estimated at an average wholesale price of 20 cents per pound. Deducting 6 cents for waste and making, 14 cents would remain for the fiber. That result would leave a considerable profit to the producer, the average cost of production not being over 3 cents a pound, where the cultivation is well managed. Let us add that the refuse, after the cleaning, furnishes 50 per cent. of good material for paper-making, the other 50 per cent. furnishing a good manure.

It is the same case with ramie, the cultivation of which can be easily associated with that of jute. The two cultures will ultimately be the most profitable of the country—especially in Louisiana, where the decaying cultivation of sugar-cane demands a substitute.

The plants whose introduction is here advocated will become for sugar-planters a timely relief, inasmuch as the large capital invested in their machinery can be utilized in ramie and jute production. Then, but a small outlay for seed and the decorticating apparatus will be necessary.

There are two species of jute, as of ramie, the *dacca* and the *dessee*. The difference between them is notable. The first grows higher in stalks, but thinner in stands. It is the reverse with the second, which, however, grows and matures faster. The yield and quality of fiber in each are nearly the same. They are distinguished by the seed. One is inclosed in a pod, the other in a bean. The seed of the dacca variety is brown; that of the dessee green. We have cultivated both varieties, and we think that the last-named could furnish two crops a year on account of its rapid growth. The dessee-crop can be made within two months after sowing.

Besides the "Ramie-Planting Association of New Orleans," several Louisiana planters have experimented on the jute. M. de Lobel-Mahy, of Saint James Parish, a gentleman of intellectual culture, has planted some for seed, and he expresses his opinion as follows:

"I am convinced that the jute cultivation can perfectly succeed in Louisiana. Most probably that plant will produce better results than the sugar-cane cultivation, which is rendered more and more difficult by high wages," &c.

Dr. B. Laplace, a planter of ability in Saint John Baptist Parish, has also tried the jute. "There is not a more profitable cultivation," he says, "if only 6 cents can be obtained for the water-rotted product."

Mr. Revillion, of Lac Arthur, Calcasieu Parish, reports a remarkable growth, and the successful destruction of coco by jute; of which he speaks, like Dr. Laplace, with enthusiastic confidence.

Mr. F. Sanfroid, merchant, of New Orleans, has obtained such a prolific growth of jute in a garden that he thinks it destined to restore the prosperity of our agricultural industry if extensively cultivated.

Dr. Landry, of New Orleans, has observed the influence of jute-growth on insects, and writes as follows: "I have seen on the 1st of October, a cotton-field in full foliage, flowers and bolls, without a single insect-bite. That cotton was surrounded by a jute-growth. All the other cotton-fields, far and around, were more or less devastated by worms. If this fact does not conclusively prove the protective influence of jute over cotton, it at least contains a great presumption in favor of the affirmative, as the emanations from the jute-flower are injurious to the insects. Paris green has succeeded generally in saving the cotton, wherever it was properly applied; but the jute would cost less and be more reliable, on account of the uncertainty of negro labor in disseminating the green poison over the cotton-leaves."

Besides these, and many other opinions expressed in favor of jute planting, besides, also, the repeated recommendations of the Hon. Frederick Watts, many merchants, manufacturers, and gentlemen of standing and intelligence in the North warmly advocate jute production in the United States. The Hon. E. H. Derby, of Boston, has for years past earnestly fostered the idea of its introduction. He has studied the question, and, by publications, has disseminated a knowledge of the subject with perseverance and talent.

Having visited jute manufactories in Dundee, that gentleman has described in some official reports the working of the article, and shown how easy it would be for Americans to establish such factories in the Union.

Thomas H. Dunham, esq., another Boston g[illegible]tleman of high patriotic sentiments, has also, for a long period, recommended the [illegible]me object, and has spoken with competency on the matter. "Our Government," [illegible] writes, "should do all in its power to encourage the growth of jute in the count[illegible] How immense would be the trade!

Manila paper is nine-tenths jute; gunny-bags, oil-cloth, burlap, gunny-cloth—what vast use we make of each and all. Sacking for wheat in the California market alone is an immense trade for jute. What is wanted in the United States is a special worker to go into the carrying out of its growth, taking such practical steps as will insure its universal growth where it is possible in this country, making the matter a special bounty to encourage and stimulate the growth of jute. No one man can prepare the work unless he has that and nothing else to attend to. A pamphlet may give facts, but it brings so much care; one has to give time, patience, care, far beyond his means. I hail with great satisfaction the specimens of American jute sent to me; they are worthy of all praise and encouragement. The country is indebted to the producer, and I would have his labor remunerated. I will do all I can to further the labor in this culture. The policy of the British government is to hold the jute trade; our policy is to bring every facility to its growth and culture here. The great use of jute in all branches will give it a constant demand fully equal to one-half of our cotton-crop. It is good for a variety of purposes."

The above opinions express the sentiments of all competent economists and enlightened citizens desirous of promoting the national welfare. Every one familiar with this important question thinks the Government should take immediate steps to popularize the cultivation of jute throughout the Union.

1st. A knowledge of the culture and production should be diffused by means of a short treatise distributed free.

2d. Premiums of sufficient amount to attract capital should be offered for the largest and best cultivation.

3d. A model jute plantation should be established and managed by the Government, under the superintendence of the Department of Agriculture, to start the great work, to impart the initial teaching, and, at the same time, to produce seed for the people. We have now in the country all the necessary elements for a successful and rapid development of jute cultivation; lands adapted to the purpose; climate congenial; seed domesticated; practical knowledge of the culture, and all the mechanical requisites for a valuable production. But little effort and outlay on the part of the Government would be necessary to develop jute and ramie culture so as to suppress foreign monopolies and save millions of dollars to the country, and to establish new industries which would give employment to millions of laborers. In every sense the matter is worthy of the patriotic attention of our national Congress.

NEW ORLEANS, LA., *December*, 1873.

CURRENT FACTS.

FERTILIZERS.

Supply of Peruvian guano.—A late report of the British consul at Callao says that the whole amount of exportable guano possessed by Peru would not, by fair estimate, reach 3,000,000 tons, a quantity which would supply the demand only for a very few years. Information obtained through careful inquiries at the Guanape and Macabee Islands up to November, 1872, placed the available quantity at these localities at about 500,000 tons and 750,000 tons respectively. At the date mentioned there were at Guanape 47 vessels loading at the rate of 600 tons daily, and at Macabee 15 ships loading over 300 tons daily. He is assured that the guano on the Lobos Islands does not exceed 750,000 tons in quantity.

Adulteration of guano.—The Peruvian government recently directed suit to be commenced against five firms in New York City, large dealers in fertilizers, charging them with refilling guano-bags bearing the trade-mark of the Peruvian government with an adulterated and comparatively worthless article, and vending the latter under the title of Peruvian guano.

Southern trade in fertilizers.—' he Charleston News states that during the season ending March 31, 187 , 36,985 tons of artificial fertilizers were

shipped from that point over the South Carolina Railroad, and that orders were still pouring in at that time.

A fertilizer manufactory.—The "Pacific Guano Mills," manufacturing what is known at the South as soluble Pacific guano, are situated at Wood's Hole, in the town of Falmouth, Mass. The establishment employs 80 men, and is able to turn out nearly 18,000 tons of the fertilizer yearly. About one-half of the product is shipped to Baltimore and Richmond, and is used in Maryland, Virginia, and Pennsylvania; the rest goes to South Carolina and Georgia. The factory buildings cover 1¾ acres, and are almost wholly devoted to the manufacture of guano and of the sulphuric acid employed in compounding the fertilizer. The fish-scrap, which enters largely into the composition, is purchased partly from fish-oil works on the main coast, and partly from parties at Long Island and Narragansett Bay. This scrap, when received, contains 50 to 60 per cent. of moisture; an immense stock of this material accumulates on hand, and occasional examination of it is required in order to the prevention of fermentation. For the latter purpose there are consumed yearly 100 tons of salt, a dark-colored article from Connecticut, the refuse of gunpowder-factories. Nine thousand tons of crude South Carolina phosphate are worked up in the course of the year. The company owns land in South Carolina containing beds of this material; also a factory at Charleston, of about two-thirds the capacity of the establishment at Wood's Hole.

Shore-mud and shell-fish deposits.—Mr. E. E. Knowles, of Eastham, Mass., communicates to the Department some information concerning the muscle-beds in that vicinity. He states that the formation of these beds has been determined by the presence of eel-grass, which grows to the length of six or seven feet in shallows where the water is but three feet deep. The eel-grass covers thickly the surface of the water, but about the time of ripening sinks to the bottom, where it gradually decomposes, forming a mud-deposit. This eel-grass mud appears to be the proper habitat of the muscle-fish, and here the latter grow in abundance for several years; then they die out for six or seven years, and as the shell itself decomposes readily, their remains add greatly to the enriching power of the mud. By slow accumulation through unknown time these muscle-beds now contain an enormous quantity of rich material. One bed of fifty acres in extent has been sounded to the depth of ten feet without reaching bottom.

Similar beds occur along the shore of the adjoining town of Orleans, and presumably elsewhere where eel-grass is found growing in rather still water. Material from such sources has been for many years applied on land in that section. One large farmer in Eastham, who has used it extensively, has expressed his preference for it over stable-manure on all crops except corn; yet some farmers set little value upon it.

Edinburgh sewage.—The Edinburgh cow-keepers pay about £8,000 for the product of nearly 400 acres of sewaged grass, fed for city milk supply. Sewage-fed milk and beef have been staples of consumption in that city for many years.

LIVE-STOCK.

A memorable sale.—The celebrated short-horn herd of Mr. Samuel Campbell, of New York Mills, N. Y., was disposed of at public sale, September 10, 1873. Buyers were present from Kentucky, Ohio, Illinois, Minnesota, the New England States, Canada, England, and Scotland.

The following prices were given for certain members of the "Duchess" family: For the three-year-old bull Second Duke of Oneida, $12,000, by T. J. Megibben, of Kentucky; for First Duchess of Oneida, $30,600, by Lord Skelmersdale, of England; for Seventh Duchess of Oneida, (yearling,) $19,000, by A. J. Alexander, of Kentucky; for Tenth Duchess of Geneva, $35,000, by Mr. Berwick, agent of Lord Bective, of Lancashire, England; for Eighth Duchess of Geneva, $40,600, by R. Parvin Davies, of Gloucestershire, England; for Tenth Duchess of Oneida, (five-months calf of Eighth Duchess of Geneva,) $27,000, by A. J. Alexander. Eleven cows of the "Duchess" family brought $238,800; of these, six went to England at $147,000. One hundred and nine animals were sold at a total of $381,990, averaging $3,504.

Western sales of short-horns.—At Waukegan, Ill., April 9, 1873, there were sold from the herd of W. B. Dodge, 36 cows, at a total of $17,680, averaging $491.11; and 12 bulls for $3,520, averaging $293.33. Highest prices for single cows, $1,010 and $1,000; sales to parties at Des Moines, Iowa, and Nashport, Ohio. Highest prices for bulls, $510 and $480; sales to parties at Marengo, Iowa, and Lowell, Ind. On the same day, and at the same place, the Glen Flora Association sold 24 cows for $18,815, averaging $783.96; and 12 bulls for $5,545, averaging $462.08. Highest prices for cows, $2,000, and $1,680; sales to parties at Indianola, Ill., and Utica, Iowa. Highest prices for bulls, $1,110 and $1,000, to parties at these places. The association also sold 50 yearling Cotswold ewes for $1,290, averaging $25.80, chiefly to Illinois buyers; 15 yearling mixed long-wool ewes for $210, averaging $14; 4 Cotswold rams and 1 Southdown ram for $171, one of the Cotswolds bringing $100; 8 Southdown ewes with lambs for $260. Six horses were sold, including four Clydesdale stallions, to Illinois and Indiana buyers. Three of the stallions brought $1,700, $1,700, and $1,300, respectively.

At Racine, Wis., April 10, at George Murray's sale of short-horns, 21 cows brought $18,615, averaging $886.43; and 9 bulls, $5,565, averaging $618.33. Highest prices for cows, $1,775, $1,700, $1,400; for bulls, $2,300, (for Seventeenth Duke of Airdrie, red, six years old, to A. B. Conger, Haverstraw, N. Y.)

Short-horn sales in Illinois.—At the sales of Mr. Edward Iles, at Springfield, Ill., June 12, 1873, 31 cows and heifer-calves sold for $26,190, averaging $846; and 8 bulls and bull-calves for $8,565, averaging $1,070; total sales, $34,755. One of the bulls, three years old, was sold to J. H. Spears & Sons, Tallula, for $6,000. The highest price obtained for a cow was $2,500, for a four-year-old, sold to Spears & Sons. At the same time were sold 49 Cotswold sheep, bucks, ewes, and lambs, for $1,493, averaging $30, and 39 Berkshire swine for $982. One boar brought $150.

At the sale of Mr. William Stewart, of Franklin Grove, June 18, 25 cows and calves brought an average of $639, and 11 bulls and bull-calves averaged $317. One cow, seven years old, was sold to Spears & Sons for $1,525.

Horse sales in Kentucky.—At A. J. Alexander's sale of thoroughbred yearlings and trotting stock at Woodburn Farm, Kentucky, June 25, 1873, 17 colts brought an average of $955.30, and 21 fillies an average of $426.67. Total amount of sales, $25,200. One of the colts brought $5,550.

Sheep husbandry in New York.—A correspondent of the Elmira Farmers' Club, and residing not far from that city, states that, on No-

vember 25, 1871, he yarded 391 sheep, which cost him $1,396.87, dividing them into four lots, and placing them in separate yards, each yard having a shed attached; size of yard 32 feet by 60, area covered by shed, 24 feet by 32; by yard and shed, 32 feet by 84 feet. They were fed straw twice a day, and hay once, grain twice a day, with salt and water always accessible. The grain fed averaged 150 pounds for each lot per day. Two hundred and fifteen sheep were sold February 19, 1872, for $2,106.57, and 176 sheep March 4, 1872, for $1,516.26; amount of sales, $3,622.83; total weight, 43,605 pounds, making an average of nearly 112 pounds. Four hundred loads of good manure were obtained, which were considered as fully offsetting the hay and straw consumed. The expenses of keeping were: grain, $558, wages of two men for three months, $120, five barrels of salt, $10; making, with first cost of the animals, a total outlay of $2,084.87; profits, $1,537.96. The hay, straw, and grain were all fed under shelter. At the time of his statement (winter of 1873,) he was feeding 400 sheep and giving 800 pounds of ground feed and shelled corn per day, in three feedings, with all the straw they would consume, but no hay. His practice is to buy sheep in the fall and turn them off before the end of March. Has fed sheep of all the common breeds, and has been most successful with grade Merino wethers; finds them more hardy and thriving better in large flocks than the coarse-wool breeds.

A correspondent of the Department, in Columbia County, gives the following account of expenses and receipts in keeping a flock of sheep, principally ewes, one year: Expenses, 450 sheep, $1,350; 40 tons of hay, $600; grain, $250; pasturage, $40; total expenses, $2,240. Receipts, manure, $150; wool, $850; sale of sheep, $2,250; sheep and lambs on hand, $250; total receipts, $3,500; showing a net profit of $1,260.

At a meeting of the Farmers' Club in Batavia, Genesee County, Mr. George Burt presented the following statistics relative to the cost and profit of feeding sheep for market: He paid for 200 sheep, for fattening, $915; for keep, two months, $64; 8 tons of hay, at $16 per ton, $128; 4 loads of corn-stalks, $16; 148 bushels of corn, 60 cents per bushel, $88.80; one barrel of salt, $3; interest on money invested, $20.75; total, $1,235.55. January 4 he sold 171 sheep, at 8 cents per pound, $1,522.40; 28, at 6¼ cents per pound, $181.79; one pelt, $1.50; total, $1,705.69; profit on the 200 sheep, $470.14.

Mr. Burt holds that sheep in winter should be kept in small flocks, less, rather than more, than 65 in a flock, in yards where they can have free access, at all times, to water; that they should be kept free from all disturbing or exciting causes; that open sheds are better for them than a close barn; and that it is best to feed grain to them whole.

Sheep husbandry in Wisconsin.—At the agricultural convention at Appleton, in the early part of 1873, Mr. Eli Stilson, of Oshkosh, who for several years has kept from 1,000 to 2,000 Merino sheep, said that for eight years his sheep had about paid expenses, leaving the manure as profit. He did not put the season of 1864 in exhibit, as that was an extra season, his wool that year bringing him $1 per pound. He has found that on land worth $50 per acre, with sheep at $2.50, and lambs at $2, sheep would repay expenses, with 7 per cent. interest on the investment, leaving the manure as profit.

English sheep sales.—At the sales of Mr. Robert Garne, of Aldsworth, England, August 1, 1873, 54 Cotswolds averaged £28 16*s.* 4*d.* One shearling ram brought 65 guineas. At the annual sale at Shrewsbury, conducted by Mr. Preece, a first-prize shearling ram, Shropshire, was sold

to Lord Lismore for 150 guineas. Bell's Messenger reports sales of 498 rams of the improved Lincoln breed from August 19 to September 16, at an average of £20 3*s.* 5½*d.*, as follows: 50 rams, at an average of £21 10*s.*; 60 rams, averaging £28 19*s.*; 70 rams, averaging £35 18*s.*; 80 rams, averaging £21 9*s.*; 56 rams, averaging £14 2*s.* 9*d.*; 64 rams, averaging £11 12*s.*; 69 rams, averaging £11 5*s.*; 49 rams, averaging £16 12*s.* Lord Chesham's lot of Shropshire rams, sold at Shrewsbury, September 11, brought an average of 33 guineas. At Lord Polwarth's sale of Border Leicesters, 21 rams brought an average of £44 15*s.*, the highest price being £195, and the next highest £160.

The Union Stock-Yards, Chicago.—The following particulars concerning the Union Stock-Yards, Chicago, are from a report made to the Illinois senate in March, 1873, by a special committee of investigation: There were received at the yards during 1872, 3,000,000 hogs, 730,000 cattle, 104,000 sheep, and about 10,000 horses. One half of the cattle were sold inside the yards, and the rest were shipped to eastern markets; of the hogs, 2,000,000 were sold in Chicago, and the remainder were shipped to other markets; the sheep were all sold in Chicago. The receipts of stock in 1872 were largely in excess of those of any former year. The capital stock of the Union Stock-Yards Company is $1,000,000, or, 10,000 shares of $100 each. Six thousand two hundred and sixty-seven shares, more than one-half of the capital, are owned by residents of Massachusetts; 785 shares are owned by parties in the State of New York; 1,088 shares are held by the Chicago, Burlington and Quincy Railroad, 1,000 shares by the Lake Shore and Michigan Railroad, and the rest of the capital is distributed among persons in various States.

Feed of hard-working horses.—Mr. J. Stanton Gould says that, having devoted considerable time to visiting the various horse-railroad stables in Brooklyn and New York City, he found that each company, after careful experiment, had fixed the daily ration per horse at 12 pounds of hay and 16 pounds of corn-meal. This had been determined on as the best and most economical feed for the work in view. The railroad-horses, on an average, are kept about four years, being then turned off as worn out; but some of the horses have been in service ten or twelve years.

Dairy-stock at the Isle of Jersey.—Mr. George E. Waring, jr., states as the results of his investigations at the Isle of Jersey, that the dairy-stock of the island is deteriorating in milking qualities, owing to the animals being now bred conformably to English preferences in respect to form and color. He thinks that America now possesses abundance of Jersey stock quite as good as can be found in the island.

FARM MANAGEMENT.

Examples of profitable cotton-growing.—The East Feliciana Patriot gives some examples of cotton-farming in Eastern Louisiana. One lad, eighteen years of age, rented 14 acres, at $6 per acre, making $84; paid for hire of horse, $30; cost of feed, $50; paid for labor, $50; total expense, $214. Receipts: 7 bales of cotton, worth $621; 200 barrels of corn, worth $200; total receipts, $821; showing a profit of $607. Another young man of the same age, rented 30 acres of land for $300; paid for hire of mule, $30; cost of feed, $50; use of implements, $10; paid for labor, $200; board of laborers, $150; total expense, $740. Receipts: 18 bales of cotton, $1,374; 300 barrels of corn, $300; 100 bushels of potatoes, $75; garden crops, $100; total receipts, $1,849; showing a

profit of $1,109. In another case a farmer states his investment in land and improvements at $4,800; value of 14 horses and mules, at $160 each, $2,240; wagons and implements, $600; total investment, $7,640. Receipts for 1872: 80 bales of cotton, net, $5,760; 1,500 bushels of corn, $1,500; 10,000 pounds of fodder, $100; value of pease, sweet potatoes, and Irish potatoes, $200; total receipts, $7,560. Expenses: Rations to 17 laborers, meal and pork, $680; one-third of the cotton for laborers' wages, $1,920; one-third of the corn and fodder for wages, $533; feed of 14 horses and mules, $700; allowance for wear of implements, &c., $350; taxes, $180; eight per cent. interest on investment of $7,640, $611; total expenses, $4,974; showing a profit of $2,586, besides receipts from raising hogs and cattle, and sale or home consumption of butter, poultry, eggs, and wool.

A New Hampshire farm.—A report for 1872 on the farm of Mr. Frye Tillotson, of Orford, N. H., states the area of his farm at about 1,500 acres; number of cows kept by him, 210, mostly native; cost of his cheese-factory, $3,500; number of men employed in the factory, 2. During the season he made 1,100 cheeses, averaging 45 pounds. He sold, in the fall, 48 hogs, averaging 420 pounds, and 40 shoats, averaging 250 pounds, dressed. He had 60 acres in corn, and cut about 300 tons of hay. During the year he cut and sold to the Passumpsic Railroad 5,200 cords of wood. The total number of men employed by him was 27. He has an apparatus for steaming corn-fodder and steams about 150 tons of hay annually. He estimates that by this process he saves one-third of the amount which would be required when unsteamed.

The "Bidwell Farm," California.—The Chico (California) Northern Enterprise makes the following statement of the products of the ranche of Mr. John Bidwell, of that place, for 1872: Flour shipped to San Francisco and Oroville, 6,000 barrels; home and mountain sales of flour, 3,000 barrels; amount of sales of cattle, $14,000; hogs, $8,000; sheep and wool, $6,000; dairy-products, not including stock, nor products consumed at home, $4,600; grain, $40,000; garden account, $20,000. The amount of land under cultivation is stated at 3,000 acres.

Contrasted methods of farming.—A correspondent of the Department in Garland County, Ark., writes that the prevailing mode of farming is very defective. "They do not plow land in Arkansas, but only scratch it." A field of twelve acres, which, cultivated in the Arkansas style, had for the two previous years yielded only 22 bushels of corn per acre, was cultivated last year by a man from Illinois. He gave it a deep plowing and cross-plowing in December, 1872, and plowed it again on the 6th of February following. This was done with a strong yoke of oxen. He "laid off," covered the corn, and plowed between the rows twice, with a horse. The result of this more thorough cultivation was that he gathered 67½ instead of 22 bushels per acre, making a difference of 546 bushels, worth $1 per bushel.

Market-gardening near Boston.—Mr. W. D. Philbrick, a market-gardener near Boston, says that some of the best gardeners within seven miles of that city employ a capital of over $700 per acre. The expenditure for manure and labor often amounts to $500 per acre. As to crops of early corn, pease, and potatoes, these do not return much profit, as they are anticipated by shipments from the Carolinas and Norfolk. Early cabbages do better, as, on account of their bulky nature, they do not bear long transportation as well.

Cost of raising corn in Illinois.—Mr. William Hunter, of Macomb, Ill., gives a statement of the cost of raising corn on 40 acres of good land, worth about $60 per acre, and within five miles of a depot. The statement is based on a yield of 45 bushels per acre, without manure. The following is a summary of his detailed account: Interest on land, and taxes, $144; risk and depreciation of team, harness, and implements, at 10 per cent. of their value, $49; cost of preparation and cultivation, seed, &c., $485.05; husking, and hauling five miles, $180; total, $485.05, averaging very nearly 27 cents per bushel.

Cost and profit of crops.—Mr. Fargo, secretary of the Batavia Farmers' Club, Genesee County, New York, kept in 1872 an item-account of the cost and profits of his farm-crops. The record is as follows:

	Expense per acre.					Proceeds per acre.			
	Manure.	Labor.	Seed.	Interest and taxes.	Total.	Straw and fodder.	Grain and vegetables.	Total.	Net.
Oats	$3 12	$10 28	$1 25	$7 47	$22 12	$6 25	$19 00	$25 25	$3 13
Corn	6 25	13 59	25	7 47	27 56	10 60	22 78	32 78	5 22
Potatoes	....	16 70	4 62	7 47	28 79		58 66	58 66	29 87
Roots	....	110 00	5 00	14 94	129 94	....	250 00	250 00	120 06
Clover	....	5 00	....	7 47	12 47	30 00	....	30 00	17 53

Expense per bushel, of oats, 40 cents; corn, 44 cents; potatoes, 20 cents; roots, 13 cents. This would show a yield per acre of oats, 55 bushels; corn, 63 bushels; potatoes, 145 bushels; roots, 1,000 bushels. The profit per bushel would therefore appear to have been on oats, 6 cents; corn, 8 cents; potatoes, 20½ cents; roots, 12 cents. The exhibit gives the potato and root crops an undue advantage in the respect that, being rather exhausting crops, they bear no expense of manure.

A Minnesota wheat-field.—The wheat-field of Mr. George Wilkinson, of Goodhue Township, Minnesota, in 1873, is reported as being two miles in length, containing 800 acres. The varieties grown were Lowland Scotch, Rio Grande, and Odessa. At harvest-time, when the report was made, seven reaping-machines were worked, and after these came 40 men binding and shocking; when this task was completed stacking-gangs were formed, and 20 teams were employed in hauling. The grain was to be shipped to Milwaukee, one car-load daily.

A large wheat-crop.—Statements on the wheat-crop of Mr. Dalrymple, of Minnesota, put the yield for 1872 at 40,000 bushels, worth $44,000; net profit, $11,000. In 1873 he had 2,000 acres in wheat. In harvesting and hauling the crop there were employed 100 men, 80 horses, 10 McCormick reapers, and 4 steam thrashing-machines. The hands received $2.50 to $3 per day, with board and lodging.

Cost of raising wheat, per bushel.—Mr. George Wells, owner of a farm of 4,000 acres in Grundy County, Iowa, makes the following statement of cost of raising wheat on a field of 150 acres, with a crop of 2,946 bushels, or very nearly 20 bushels per acre: Plowing, at $1 per acre, $150; 15 days' labor harrowing, $15; 225 bushels seed-wheat at $1 per bushel, $225; 8½ days' labor sowing, $8.50; 60 days' labor harvesting, $60; 77 days' labor hauling grain from shock and threshing, $77; keeping teams and use of machinery, $50; total, $585.50, averaging about 20 cents per bushel.

FRUIT.

Fruit in California.—The Marysville (California) Appeal, of July 28 and 31, 1873, stated that Mr. J. W. Briggs had shipped five car-loads of pears eastward during the season. One load went to Chicago, one to New York, and three to Denver, the third to the latter place having just been forwarded. Freight to Chicago, per car, by passenger train, $900, by slow freight $500; to New York, by passenger train, $1,075; to Denver, by slow freight, $475. According to returns from Denver the fruit had sold there at 12 cents per pound. The railroad had until recently declined to take through a car attached to the passenger train; in future he would forward wholly by express trains. The expenditure for boxes by fruit-growers in that vicinity is placed at over $10,000 yearly. One grower's annual expenditure for that purpose had amounted to $3,000.

Messrs. Gould & Co., fruit-dealers of Santa Clara, have a store-house at Truckee, where the temperature is more suitable for keeping fruit than that of Santa Clara. The store-house, which is chiefly of brick, is 100 feet long, 36 feet wide, and 15 feet high. There were in store about the 1st of March, 1873, in round numbers, 270,000 pounds of winter-apples, and 25,000 pounds of winter-pears. The fruit is carefully spread in open racks, and the temperature of the house is kept quite low, ranging from 28° to 40° Fahrenheit; 36° is held to be the most suitable temperature. The varieties of apples stored are: Newtown Pippin, Pearmain, Belle-fleur, Baldwin, Spitzenburgh, Rhode Island Gre.ning, and Swaar. The Newtown Pippin is said to keep the best. The loss of fruit up to March 1 did not exceed 5 per cent. The larger part of the fruit is sent to the San Francisco market. Some amounts are sold in the vicinity, and to towns in the State of Nevada, and a few car-loads are sent to Chicago and New York.

Shipments of apples from Western New York.—At the meeting of the Western New York Horticultural Society, at Geneva, N. Y., in January, 1873, a special committee reported the following shipments of apples from that region during the season: From points on the Erie Canal between Syracuse and Lockport, and including these two places, 435,893 barrels; west of Lockport, by lake ports, estimated, 250,000 barrels; by Central and Erie Railroads, 500,000 barrels; total, 1,185,893 barrels. Dr. Sylvester, who read the report, put the amount withheld for home consumption at about as much more, making the crop over 2,000,000 barrels, worth $3,000,000.

Preservation of apples in store.—Mr. Calvin Pitcher, of Belfast, Me., a well-known apple-grower, who has 40 acres of orchard, mostly in bearing, keeps his apples in good condition and flavor, from harvest-time till the ensuing summer, by exposing the fruit daily to a free circulation of air through the place of storage. He stored for keeping 1,200 bushels of Baldwins of the crop of 1872, and disposed of the last of the lot in mid-summer of 1873, at prices ranging from $1 to $2 per bushel.

Fruit-canning in Illinois.—The Western Agriculturist, of Quincy Ill., gives the following items concerning the business of fruit-canning, being chiefly of operations in that neighborhood: The Alden factory at Fowler, during the season of 1872, worked up 13,000 bushels of apples, at an average cost of 27½ cents per bushel, 75 bushels of peaches, at 50 cents per bushel, and 500 pumpkins averaging 4 cents each. One canning and pickle factory in Quincy canned 5,155

bushels of tomatoes, 2,800 bushels of peaches, and 4,000 quarts of raspberries, and made 3,000 barrels of pickles. During the packing season 200 girls and 25 men were employed. A branch of the house at Cobden, in the southern part of the State, put up 7,000 bushels of peaches and 5,000 quarts of raspberries, using 120,000 cans. Another firm in Quincy put up 27,600 cans of fruit, 12,000 bottles of pickles, and 6,000 bottles of horse-radish, and another house in the same city, 42,000 cans of fruit and 700 barrels of pickles.

Fruit-canning in Delaware.—Reports of operations for 1872 of the canning establishment of Richardson & Robbins, of Dover, Del., state their consumption of peaches during the season at 18,000 bushels; of pears at 2,000 bushels; of tomatoes at 480 tons; of strawberries at 30,000 quarts; of cherries at 30,000 pounds.

Drying figs at the South.—The editor of the Rural Alabamian, who has had some experience in the drying of figs, says that there is no more difficulty in putting a first-rate article of dried figs into the market from the Gulf States than from Smyrna. The difficulty has been that the right varieties have not been cultivated. The common large yellow fig of the South is not well adapted for drying, being too juicy, too hollow, and too open at the eye, and it is very liable to injury from damp or rainy weather at the time of its maturity. He recommends the Brunswick, Large White, Genoa, Smyrna, and Figue d'Or varieties for drying.

GRASS, HAY, ETC.

Contracts for hay.—A correspondent of the Country Gentleman in Cortland County, New York, near the center of the State, writes that the great abundance of hay in that section in 1872 brought in buyers who, during the winter, purchased several hundred tons at $15 per ton, for shipping to Scranton, Pa., and other mining regions, Philadelphia, and New York. One farmer, whose farms comprise about 1,900 acres, had contracted for the disposal of all his hay for the next five years at $15 per ton at the barn.

Receipts of hay at New Orleans.—The New Orleans Picayune estimates the yearly receipts of hay in that city at 250,000 bales. Usual selling price, per ton, $20 to $30; this year, 1873, it has reached $50. [The monthly reports of the Department show $55 in February, at New Orleans.]

Alfalfa in California.—The San Francisco Bulletin says that Mr. Solomon Jewett, of Kern County, one of the oldest and largest sheep-raisers in that State, and one of the first to recognize the value of alfalfa for feeding stock, has now 450 acres sown in alfalfa, and that his valuable fine-blooded Merino sheep are kept exclusively on this feed, with very satisfactory results. Mr. Jewett holds that in Kern County one acre of alfalfa will keep 20 sheep in good condition. He finds irrigation chiefly beneficial during the first year, or until the roots of the plant have shot down far enough to reach moisture; after that it is useful as a stimulant to extraordinary yield or for the drowning out of gophers.

Bermuda grass in Georgia.—Mr. Dougherty, a hotel-keeper of Greensborough, in 1872 sold $114 worth of hay from Bermuda grass, the crop of one measured acre of land near that village. The hay was sold in the field, at $20 per ton.

The chufa.—The editor of the Rural Alabamian, in reply to a paragraph in the Southern Farm and Home, strongly recommends the chufa (*Cyperus esculentus*) as a feed-crop for hogs. His attention was first called to the subject by a notice in the Agricultural Report for 1854, and in the spring of 1855 he received from Washington a small package of the seed. He planted every year until, during the late war, he lost the seed by neglecting one year to plant. In 1872 he succeeded in procuring a supply from Georgia, and by this means renewed the crop. He has found the chufa to be highly relished by hogs, which prefer it to the peanut, even, and fatten on it more quickly; indeed, all kinds of stock are fond of it. One bushel of nuts will seed an acre, and the yield per acre on good land ranges from 200 bushels to 500 bushels; as the hogs gather the crop, there is no expense of harvesting. He does not find it necessary in that climate to water the young plants. The plant resembles nut-grass, (*Cyperus repens*,) "but does not possess the power of spreading itself like that pest of southern fields." (Agricultural Report, 1855, page xiii.)

Curing corn-fodder.—Mr. William Crozier, of Long Island, N. Y., cures his corn-fodder (sowed corn) by stacking it on pole platforms, building the stack around barrels which are provided with rope handles. As the stacks are carried up the barrels are drawn up, and in this way ventilating-chimneys are provided.

POULTRY AND EGGS.

Egg and poultry packing in New York.—A letter to the Country Gentleman, (issue of May 15, 1873,) giving an account of a visit to the egg and poultry packing establishment of Mr. A. R. Robinson, near Greene Village, Chenango County, stated that Mr. Robinson had already bought, during the season, 120,000 dozen eggs, which cost him, cured and packed, 20 cents per dozen. This quantity would make about 1,600 barrels. In the turkey-yards there were at the time of the visit over 2,000 turkeys, many weighing 28 to 30 pounds, and large numbers of ducks were kept. Mr. Robinson has a method of freezing poultry so that it will keep in perfect condition from the early part of winter to April; the peculiarities of his process are not given to the public. His packing-house held 18 tons of poultry. Other establishments in Chenango County do a large business in egg-packing, &c.

Storing eggs.—Wright's Illustrated Book of Poultry says that a systematic trial for two seasons has shown that, for purposes of long keeping for eating or breeding, eggs should be packed with the large end downward, instead of placing them on the small end, as is commonly done. The longer the eggs are kept the greater difference will be found in the results of the two methods. Experiment has proved that eggs placed as recommended may be set and successfully hatched, with remarkable uniformity, at ages which with the usual method of storing would render success almost hopeless. The practical philosophy of the case is alleged to consist in delaying the spread of the air-bubble and its detachment from the membranous lining of the egg, thus retarding alterations destructive to vitality.

Receipts of eggs in New York.—The Poultry Bulletin states the wholesale value of the eggs received in New York City in 1870 at $4,928,917.80; value of receipts in 1871, $5,661,973.85; in 1872, $6,292,250.57. The extremes of prices in the latter year were greater than in either of the

two preceding years. The highest average price paid was in February, 33 cents per dozen, and the lowest in May, 15½ cents per dozen.

A poultry account.—A poultry-keeper gives the following account with 63 hens, crosses of white-crested black Polands, Bolton Greys, and Spanish, for the year ending January 1, 1873: Expenses, 70 bushels shelled corn, at 50 cents per bushel, $35; 730 gallons sour milk (2 gallons per day) at 2 cents per gallon, $14.60; 2 bushels of lime, 50 cents; total expenses, $50.10. Receipts, 557 dozen eggs, $84.43 (averaging 15.16 cents per dozen;) 90 chickens sold at 25 cents each, $22.50; total receipts $106.93, showing a profit of $56.83.

Production of eggs.—The following experiment was made in 1872: Ten pullets of each of the following breeds—each fowl being within one week of six months of age—were placed in yards 40 feet square, with comfortable houses; during six months an account was kept of food consumed and eggs produced. The Dark Brahmas consumed 369¼ quarts of corn, oats, and wheat-screenings, costing $5.77, laid 605 eggs, which sold for $10.08, and at the close of the experiment weighed 70 pounds; profit realized on eggs, $4.31. The Buff Cochins ate 406 quarts of the feed, laid 591 eggs, and at the end of six months weighed 73 pounds. Cost of feed $6.34, realized from eggs, $9.85; profit on eggs, $3.51. The Gray Dorkings ate 309 quarts of the feed, costing $4.87, laid 424 eggs, which sold for $8.73, and at the close of the period weighed 59½ pounds; profit on eggs, $3.86. The Houdans ate 214 quarts of feed, costing $3.35, laid 783 eggs, which sold for $13.05, and weighed 45¼ pounds; profit on eggs, $9.70. The Leghorns ate 231½ quarts of feed, costing $3.62, laid 807 eggs, which sold for $13.55, and weighed 36½ pounds; profit on eggs, $9.83.

Consumption of eggs.—At the annual session of the New Brunswick Board of Agriculture, in 1873, the secretary said that during the fiscal year the province had imported eggs to the value of $45,000.95, and that "there were no eggs to be had" in the city, though it is surrounded by a rural population.

IRRIGATION.

Shower irrigation in England.—Mr. Isaac Brown's shower irrigation is described as an arrangement of pipes laid at regular intervals just within the surface of the land, from which pipes water under pressure is distributed in showers evenly over the intervening area. In case it is desired to make a seed-bed a knife-bladed harrow is used to cut and reduce the surface. At Stoke Park, near Windsor, England, lead pipes are laid in parallel lines 48 feet apart. A twelve horse-power steam-engine, working a Tangye force-pump, draws water from a pond and forces it through the perforations in the pipes. With a pressure of 60 to 70 pounds to the square inch, equivalent to the force derived from a head of 120 feet, 1½ acres are showered at a time, ten tons of water being used in 15 minutes. This area having been watered, the irrigation is applied to other portions of the land in turn. The work is mostly done in the night to prevent injury to the grass from watering under a hot sun. Mr. Brown reports on the operation of his invention at Stoke Park in 1872 that, while 430 acres of pasture and park gave scarce any support for cattle after the summer's drought, 40 acres irrigated according to his system maintained 120 large Highland bullocks—3 bullocks per acre—in fattening condition, from August till the 1st of November, and this after having already afforded two heavy crops of hay amounting to about 5 tons per acre. The cattle while on this pasture received

no other food than grass. On 6 acres of such irrigated land 200 sheep, Leicester and Cheviot crosses, were being kept in 1873, in fattening condition, without other food than grass. They were folded within two rows of light but firmly-made hurdles, extending across the breadth of the field—200 yards—and 7 yards apart; these hurdles were moved forward four times per day, thus giving opportunity for rapid restoration of grass on the land passed over. According to estimate the expenses per acre were: Rent, 30 shillings; manual labor, 5 shillings; coals, 10 shillings; artificial manure, 120 shillings; interest and wear of pipes, engine, &c., 40 shillings; interest on cost and wear of hurdles, 20 shillings—total, £11 5*s.* per acre. Receipts: Keep of 33 sheep for 28 weeks, at 6 pence each, per week, £23 2*s.* Profit per acre, £11 17*s.* It was claimed that under this system the land was capable of maintaining twice the above stated number of sheep per acre.

Increased value from irrigation.—A correspondent of the Pacific Rural Press, writing from San Joaquin Valley, California, says that, as a result of irrigation, farmers along Los Baños Creek have recently been offered $30 and $35 per acre for land which would not have brought $5 per acre two years ago. The cost of irrigation is not over $1.50 per acre. One great advantage growing out of irrigating enterprises is the facility which they afford for drowning out ground-squirrels and gophers, those pests of California farmers.

Irrigation for the market-garden.—Dr. F. M. Hexamer, of Westchester County, New York, a well-known grower of vegetables and small fruit, puts his loss by drought in the summer of 1873 at $3,000, a loss which he might have escaped had he been provided with machinery for thorough irrigation—wind-power, pipes, and force-pumps—the cost of which would not have been far from $3,000.

TREES AND TIMBER.

Premiums for artificial groves.—The Illinois State Board of Agriculture have offered a premium of $500 for the best artificial grove of five or more acres planted after January 1, 1873, and before December 1, 1874, and a premium of $100 for the best one acre, under similar conditions, the premiums to be awarded in 1881. Annual statements are to be submitted to the board showing the method of culture and the cost thereof, and after the third year a cross-section of one tree of each variety planted is to be delivered to the board, with a statement of the height attained by the tree; these specimens are then to be placed in cabinet for permanent reference.

Pine-plantations.—Massachusetts papers state that in Eastham, Cape Cod, a thousand acres of land are now covered with thrifty pines from seed sown—land which, but for this protection, would have been a waste tract of shifting sand. Game has consequently increased, and quail, plover, and other birds are reported plentiful. Valuable pine-plantations have also been formed in other towns on the Cape, replacing, to some extent, woods which were destroyed in the earlier periods of settlement.

Durable posts.—Mr. F. R. Elliott, of Cleveland, Ohio, writing about the commencement of 1873, gives the following statement of his experience in preparing fence-posts. In June and July, 1850, he employed men to get out fence-posts from his woods of maple, elm, basswood, linden, ash, &c. These posts, in the green state, rough-shaped, and from trees of all ages and all the named varieties, he treated with a

composition of coal-tar from the gas-yards, with unslaked lime in equal proportion, by measure, applying the mixture while effervescent to that end of the post which was to enter the ground. The posts were set in cold clay ground. In the spring of 1872 it became necessary to remove the fence, and on taking up the posts 95 per cent. of them were found perfectly sound.

Pitch-pine in England.—A writer in one of the leading agricultural journals of England, treating on the subject of timber in Canada and the United States, says that the consumption of pitch-pine is steadily increasing in England. The wood is characterized as hard, heavy, finely marked, capable of taking a brilliant polish, and nearly as durable as oak; when sawn, the color is a variegated, dullish red, though some lots are quite light in hue. Pitch-pine is in high repute for flooring for first-class residences, public halls, ball-rooms, &c. Within his recollection the first cargo imported was a drug on the market, and could be got off only in small quantities, but the qualities of the wood soon brought it into favor. The imports in 1871 amounted to nine cargoes, containing 4,200 loads of square timber, and 17,000 pieces sawn plank and deal. Pensacola, Fla., is a leading port of supply.

MISCELLANEOUS.

Chemical agricultural stations.—Professor Church, in a recent essay before the Cirencester Chamber of Agriculture, England, on the work of chemical agricultural stations, said that very probably the first institution of this character was that at Rothamsted, but that and the one established by Bousingault on the Continent were private, and restricted in plan. In 1851 one was created near Leipsic, which is still in being, and one of the best managed in Germany. There are now (at the commencement of 1873) thirty-eight stations in Germany. In France the first was founded in 1858, the first in Belgium in 1872, and the first in Italy in the same year. In the south of France and in Italy there are stations devoted to the study of the treatment and manufacture of products derived from the vine, tobacco, silk, &c. Ten or twelve stations are devoted to these and olives and olive-oil. There are six stations in Switzerland, including stations devoted to milk, cheese, and other milk-products. There are two stations in Sweden and one in Holland; in England, none that are actually entitled to the name.

One of the leading aims of the German agricultural stations is the control of artificial-manure manufacture. To give an illustration of the work done in that line, in 1867, at one agricultural station in Germany, there were made analyses covering manures to the amount of £135,000, sold by manufacturers in the neighborhood. The manufacturer of the manure makes a contract with the station by which the professors are allowed to visit the warehouse at all times, and take samples from whatever packages they may select and analyze them. If the inspectors find the article to be of standard character the dealer is furnished with a certificate to that effect, and the results of the analysis are published by the station for the information of the public. One of the duties of the stations is to prosecute field experiments, some of which are carried on by a number of stations in concert. All these institutions throughout the empire are in regular correspondence with each other. Another object is the teaching of students.

There are not fewer than 2,000 agricultural associations in North and South Germany; some small, averaging, perhaps, 40 to 50 members; others contain fully 1,000 members. These societies take a large part

in founding the stations. Government gives a small annual subsidy; private contributions and fees from analyses of manures assist. The total income of the station at Halle is £773, of which the State gives £150 and the agricultural societies £145. The fees arising from the control of manufactures of artificial manures amounted in 1868 to £412, these being the main support of the station. A portion of the fees for private analyses made by the chemist goes to the funds of the station, and the sum of £66 was realized by the institution in that year from this source. The income of some of the smaller stations is only £150. A station generally takes its inception from the efforts of neighboring land-owners, practical agriculturists, and scientific men. These persons call a meeting, fix upon rules adapted to the locality, and put themselves in communication with managers of existing stations, obtain a small subsidy from government, and in a few months commence operations.

Model farms in Ireland.—A correspondent of the London Field refers to the current system of agricultural education in Ireland under governmental auspices. The system now includes more than two hundred establishments, (model farms, &c.,) under the lead of the Glasnevin Agricultural College, with a state expenditure of about £6,000 yearly. Many of the model farms yield a large yearly profit, the Glasnevin farm, with a rental of £4 per acre, yielding a profit of more than £600 yearly, on an average. The writer testifies from personal knowledge to the great good effected by the model farm, which has sent out a superior class of farmers, managers of depots of seeds and implements, and persons connected with the stock trade, a class which has greatly aided in the improvement of farm practice.

A beneficent enterprise.—Soon after the close of the war, an association of Friends was formed in Baltimore, for the purpose of assisting impoverished Friends in the Southern States, and chose the agricultural districts of North Carolina for their chief field of operations. In 1867 the association purchased a farm of 200 acres at Springfield, in that State, and placed in charge as superintendent an experienced and energetic farmer, furnishing him with proper implements and other means for teaching an improved agriculture. He was instructed to exemplify to the surrounding people the utilization of manurial resources, the benefits of drainage and thorough cultivation, the advantages of suitable rotation, and the economy of improved stock, and to organize agricultural clubs, &c. When the farm was bought, the want of pasture and hay throughout that region made stock husbandry an inconsiderable interest. The superintendent, therefore, at the outset, distributed two tons of clover-seed at cost. Several tons of Peruvian guano were distributed in like manner among those who desired to use it in setting clover on exhausted land. The purposes of the association have been successfully prosecuted. The superintendent's report says:

> The effect of our operations on the community can be seen for fifty miles around. About 15,000 acres have been sown with clover in the surrounding counties since our operations commenced. Many improved implements have been introduced. Instead of the scythe and the cradle, are frequently seen the mower and the reaper. Large numbers of people from all parts of the State continue to visit the farm, to see for themselves the new way, and they very generally express themselves satisfied that it is an improvement on the old exhaustive system. All such, more or less, will become centers of influence and improvement. The effect of our educational and agricultural efforts in staying the tide of emigration to the West is very apparent and has already saved to North Carolina hundreds of her best citizens.

On a small stream running through the farm a bone-mill has been built at a cost of $875, capable of crushing and grinding 1,500 pounds of bones daily.

English colonization in Kansas.—Mr. George Grant, a wealthy English merchant, has purchased five hundred and forty square miles of land in the central part of Kansas, for purposes of colonization. The tract is watered by the Victoria River and Dry Creek, and numerous springs afford facilities for irrigation. There is abundance of stone suitable for building, and coal and wood are readily accessible. Stock-raising will be a prominent feature in the enterprise, and with this in view cattle and sheep of the most approved English breeds have been imported for breeding. Mr. Grant offers the land at prices varying from $2.50 to $10 per acre, according to advantages of situation. Individuals of the higher ranks of English society are interested in the undertaking as buyers of land and prospective settlers, and favorable terms are held out to emigrants of small means. The Workingmen's Farming Association has purchased eight square miles of the tract, to be resold in small lots.

Farming near the Rocky Mountains.—Mr. Elisha P. Horne, Colfax, Fremont County, Colo., writing to the Department under date of November 18, 1873, says that from one acre seeded with Bresee's Peerless he obtained 900 bushels of potatoes; from one acre of Early Rose, 830 bushels; from one acre of Neshannock, 600 bushels. The preparation and cultivation of the field were as follows: In the fall he plowed 8 inches deep; in the spring marked out hills 3 feet apart each way, and in each hill dropped three pieces of potato, 6 inches apart, one eye in each piece. After the plants came up the field was dragged with an iron-toothed harrow, and when they were 6 inches high they were hilled and hoed. When the weeds had started a double-shovel plow was run through the field in both directions, namely, lengthwise and crosswise. The seed for three acres weighed, when cut, 568 pounds. Other farmers in the neighborhood planted six to eight times that proportion per acre, and had many small potatoes, while he had few. He adds that he preceded, by one year, any other settler in that section—Wet Mountain Valley—and that his ranch is within three miles of everlasting snow, lying close under the Rocky Mountains, and never requiring irrigation. On his first arrival in that locality it was prophesied that, on account of the exposure of the situation, he would not succeed in farming there; but the contrary has been the result. During four years he has obtained 40 to 50 bushels of wheat per acre. About the 10th of August, 1873, he sowed 19 acres in wheat, 55 pounds of seed per acre, and at the date of his letter the plants had reached 8 inches in height, covering the ground entirely and promising well. The first snow of the season had fallen on the morning of his writing, and lay 4 inches deep.

Records of potato-crops.—Accounts reproduced in the report of the Royal Agricultural Society of England for 1870 show that about 1812 the potato-crops of the isle of Jersey commonly averaged 450 bushels to 600 bushels per acre, calculating 60 pounds to the bushel. The potato being an important staple of the island, the ground was carefully prepared and well manured. Four hundred bushels are recorded as having been obtained on a Jersey vergée, being at the rate of 900 bushels per acre, and smaller areas sometimes exhibited a much larger rate of production. There are records of quite as large yield per acre in the United States. Eight hundred to 1,000 bushels per acre are stated to have been grown on the uplands of the "Pan-Handle," West Virginia. As a rule, a virgin soil, specially adapted by constitution to the potato-crop, helped by a favorable climate, will yield results far exceeding those attained by liberal manuring on old land.

Irish emigration.—The agricultural statistics of Ireland for 1872 show

that 78,781 emigrants left the Irish ports during that year, making an increase of 6,777 over the emigration of 1871. Of the total number stated, 46,741 were males.

Beet-sugar in California.—A slip from the Sacramento Record, received in the early part of 1873, gives the following particulars concerning the operations of the beet-sugar factory in that vicinity. Cost of factory, machinery, and outfit, $225,000; usual working force, 160 men. Five steam-engines, aggregating 500 horse-power, are employed in the works; 11 cords of wood are consumed daily. The area in beets amounts to 1,450 acres. The consumption of beets has been at the rate of 7,000 tons annually, and several thousand cattle, sheep, and hogs are fattened on the refuse. The beet-crop in 1872 was a partial failure, on account of the ravages of worms. The Record's statement does not indicate that any great profits have as yet accrued, but a permanent success is confidently expected.

Chiccory in California.—According to California papers, there were in that State at the close of 1872 three companies engaged in the cultivation of chiccory, and its preparation for market by roasting—one company in Yolo, one in Sacramento, and one in Joaquin County. The Sacramento company commenced in the spring of 1872, with 70 acres. The average yield per acre is given at fifteen tons, which would turn out three tons of roasted. The Stockton Independent placed the chiccory-crop of the State at 5,000 tons; manufacturers were of the opinion that the growth of the interest in California would be slow, on account of the recent reduction of duty on the imported article. The rich alluvial soils of the river bottoms are best adapted to the crop. The Stockton factory (Joaquin County) paid $15 per ton for the green root.

Reclaimed tule lands.—Reports from Sherman Island, California, for the season of 1873 state that 7,200 acres were cultivated in grain, 400 acres in potatoes, and 150 acres in alfalfa.

First and last prices.—Mr. John H. Carmany, in a recent paper on California, says that he has seen wheat selling there for twice what the farmer had obtained for it; wine retailed at San Francisco hotels for $1.50 per bottle, while it sold in Los Angeles for 40 cents per gallon; grapes sold at 8 to 10 cents per pound, while the producers received only 75 cents per hundred pounds, and fruit thrown into the bay at San Francisco which had rotted on dealers' hands at 5 cents per pound, while the growers would have been glad to obtain for the same article $20 per ton.

Steam cultivation in Germany.—A recent letter from John Fowler & Co. to J. K. Fowler says that the firm is making about 100 steam-plows yearly for the English market, and 50 to 60 for foreign countries—principally double-engines. Two-thirds of those sold in England are to parties who let on hire. About 50 of the Fowler plows are working in the Magdeburg district, Germany, in cultivating sugar-beet. The beet grown on steam-plowed land shows a gain of nearly 2 per cent. of sugar, and nearly 20 per cent. in the crop-weight per acre, and this success has induced all the sugar-growers to use steam cultivation. They usually work the land to a depth ranging from 12 inches to 15 inches, never less than 12 inches.

Canning sweet-corn in Maine.—Mr. Levi Bartlett writes to the Albany Country Gentleman that J. W. Jones & Co., of Bridgeton, Cumberland County, put up at their establishment, in 1872, 510,444 cans of sweet-

corn, the product of 228 acres. The company paid out for corn $16,175.55, and for labor $12,886.61. The "Bridgeton factory" employed 650 laborers in cutting up 500 acres of corn, and used 706,388 cans. A gentleman of the same county, who has been largely engaged in the business, says that the process of canning is simply this: The corn is sliced from the cobs and put in cans; these are sealed and placed in baths where they are boiled for two hours; are then taken out and each can pierced with an awl to allow the confined air to escape. The instant the outward current ceases they are resealed, and they are then boiled for four hours. This is the whole of the process. The difficulty lies in the manipulation, not in an obscurity of method of treatment. The following examples are given of gross receipts from sweet-corn grown for canning: Mr. W. Chute, of Otisfield, received, in 1872, for the product of two acres, $197.60; Mr. J. Titcomb received on one acre, $129.

A western factory statement says that in canning sweet-corn the cans are pierced twice during the process of preparation.

Paper from the hop-stalk.—The Maidstone Journal, England, informs us that paper is to be manufactured largely in that country from the sheath of the hop-stalk, after removal of the outer skin. The process is a French invention, and is said to afford material of great suppleness and delicacy.

Paper from tules.—Mr. S. D. Baldwin, of Marysville, Cal., has patented a process for making paper from the California tule; it is reported that by this method the best qualities of writing and printing paper can be obtained from the material.

Potato-disease in Great Britain.—The loss from potato-disease in the single county of East Lothian, Scotland, in 1872, was estimated by experienced agriculturists of that section at nearly £150,000.

The wheat supply of Great Britain.—Mr. J. B. Lawes, the English experimentalist and statistician, estimates the amount of wheat which will be required to supply the consumption of the United Kingdom of Great Britain during the year ending August 31, 1874, at 22,251,780 quarters, or 178,014,240 bushels, of which 103,089,240 bushels must be provided from foreign sources. He admits the possibility that high prices will reduce the actual demand somewhat below the indicated quantity.

Expenditure for grain-sacks in California.—The president of the California State Agricultural Society, in a recent address before that body, placed the expenditure for grain-sacks in that State in 1872 at $2,450,000. These sacks are made from jute grown in India and worked up in Scotland.

Lifters for lodged crops.—Mr. A. Hughes, an English agriculturist, has invented a lifter, attachable to reaping-machines, for the purpose of lifting lodged crops while harvesting. The invention, as adapted to use on flat lands, consists of a long, wooden, iron-pointed, and slightly curving prong, secured to the platform of the reaper by two bolts and nuts, and projecting about 20 inches in front of the knives; a lifter is placed over every third or fourth finger. The amount of lift is regulated by a wedge under the heel of the prong. In case of ridge and furrow, or very uneven ground, the prong is hinged on a pin in a small cast-iron chair or shoe, which is fastened to the platform; a coiled spring under the heel of the lifter allows the latter to rise and fall with the irregularities of the land. The mode of applying the apparatus may be varied according to the make of the machine to which it is attached. It is stated that

these lifters, which cost but little, were found very effective in the harvest of 1872.

Red pepper for cabbage-lice.—Mr. J. W. Still, of East Oakland, Cal., writes, that finding a lot of about 200 fine cabbages infested with lice, he sprinkled the plants with red pepper, excepting a few which he left without treatment for comparison. All those treated with the pepper were entirely cleared of the insects, while those plants which received no application were covered with vermin.

Phylloxera vastatrix.—The French Society for the Encouragement of National Industry have offered a prize of 2,000 francs, to be given in 1874, for the discovery of the manner in which *Phylloxera vastatrix* is propagated from one vine-stock to another. A knowledge of this point is essential toward arresting the destruction which is being wrought by the insect.

Shore-fisheries of New England.—Professor S. F. Baird, United States Commissioner of Fisheries, reporting on his investigations in 1871 and 1872 on the New England coast, says that the shore-fish of that region have been decreasing in numbers during the last twenty years, and with especial rapidity since 1865. In 1871 the reduction was so great that summer fishing with line and hook was a failure, and traps and pounds bore the burden of supplying the market. This decrease is attributable to the combined effect of the fish-pounds or weirs. He recommends legislative prohibition of the use of traps or pounds during the spawning season, or for certain days in each week during that season.

Oregon salmon.—Oregon papers of the last of August state that the salmon season of Oregon, just closed, had been the most successful one ever experienced by the Columbia River fisheries. One hundred and fifty thousand cases had been put up, valued at $6 per case; also 3,500 barrels of salted salmon.

Overland shipments of tea.—The overland shipment of tea from San Francisco in February, 1873, is stated at 326,854 pounds.

A superb azalea.—Professor Sargent's collection of azaleas, at Brookline, Mass., contains about 200 plants. One of these is 5 feet high, 16 feet in circumference, and bears more than 3,000 blossoms. It is dome-shaped in form, and nearly thirty years old. The proprietor has been offered $1,000 for the plant.

Sales of bouquets in Paris.—A French journal states that the number of bouquets of violets sold annually in Paris averages 5,825,000.

FARM EXPERIMENTS.

The following collection of brief experimental reports is in continuation of compilations of like character in former reports of the Department. It may be well here to repeat the remark that, with respect to any contested question of agriculture, even the most carefully-conducted and apparently conclusive experiment is rather to be regarded as an approximation to truth, requiring further test by practice before a complete decision can be reached.

FEEDING STOCK.

COOKED AND UNCOOKED FEED.—Mr. E. S. Lawrence, head farmer of the Illinois Industrial University, reports an experiment in feeding thirteen head of cattle from November 25, 1872, to April 15, 1873. The cattle were short-horn grades, selected from forty-eight steers with the purpose of obtaining as great a uniformity of character as was possible, and were three years of age at the close of the experiment. From the commencement of the test up to March 10, 1872, the animals were fed as follows:

Nos. 1 and 2 received, each, 15 pounds of corn-meal daily, mixed with 10 pounds of cut corn-stalks wet in a box and steamed 45 minutes with a pressure of 20 to 25 pounds of steam.

No. 3 had the same feed as above, except that for the first five weeks he received one-half bushel of carrots instead of the morning feed of 7½ pounds of meal.

No. 4 was fed in the same manner as No. 3, except that the meal and stalks were not cooked.

Nos. 5 and 6 were fed like Nos. 1 and 2, except that the rations were not cooked.

Nos. 7 and 8 received daily 18 pounds of corn in the car, broken up with chopped corn-fodder. These were all fed in the barn in box-stalls, bedded down; were put up at 4 o'clock p. m., and turned out at 10 a. m. During the day they had stalks and straw in the yard.

Nos. 9 and 10 were fed in the yard, each receiving daily 15 pounds of meal, with stalks and straw fed on the ground; had a good shed.

Nos. 11, 12, and 13 were fed in an open yard, without shelter, with thirty other cattle, and received, each, 18 pounds of corn in the ear, broken up and fed in boxes, with corn-fodder on the ground sufficient for feed and bedding.

The following table gives results up to March 10, 1872:

Number.	Feed.	Weight, November 25.	Weight, March 10.	Gain in 15 weeks.	Cost of grain.	Cost of fodder.	Cost of labor.	Total cost of feeding.	Value November 25.*	Value March 10.†	Loss.	Gain.
		Lbs.	*Lbs.*	*Lbs.*								
1	Cooked meal and stalks.	1,155	1,255	100	$8 71	$3 15	$2 02	$13 88	$49 08	$59 62	$3 34	.....
2	Cooked meal and stalks.	1,220	1,275	55	8 71	3 15	2 02	13 88	51 85	60 56	5 17	.....
3	Cooked meal, stalks, carrots	1,145	1,275	130	......	3 15	......	......	48 66	60 56	......	.....
4	Raw meal and stalks, carrots	1,155	1,330	175	......	3 15	......	......	49 08	63 17	......	.....
5	Raw meal and stalks...	1,235	1,360	125	7 14	3 15	2 02	12 31	52 49	64 60	0 20	.....
6	Raw meal and stalks...	1,145	1,265	120	7 14	3 15	2 02	12 31	48 66	60 08	0 89	.....
7	Corn and stalks........	1,225	1,375	150	5 40	3 15	2 02	10 57	52 06	65 32	......	$2 69
8	Corn and stalks........	1,135	1,285	150	5 40	3 15	2 02	10 57	48 23	61 03	......	2 23
9	Meal in shed...........	1,255	1,460	205	7 14	3 15	0 52	10 81	53 34	69 35	......	5 20
10	Meal in shed...........	1,145	1,315	170	7 14	3 15	0 52	10 81	48 66	62 47	......	3 60
11	Corn in yard...........	1,375	1,490	115	5 40	3 15	0 52	9 07	58 44	70 76	......	3 25
12	Corn in yard...........	1,215	1,360	145	5 40	3 15	0 52	9 07	51 64	64 60	......	3 89
13	Corn in yard...........	1,045	1,165	120	5 40	3 15	0 52	9 07	44 41	55 33	.....	1 85

* At $4.25 per 100 pounds. † At $4.75 per 100 pounds.

The corn in the ear was valued at 20 cents for 70 pounds, which was rated as equivalent to a bushel of shelled corn. An analysis of the statement shows also that the cooked meal was charged at the rate of 26.55

cents per bushel of 48 pounds, and the uncooked meal at 21.77 cents per bushel, making a charge of 4.78 cents per bushel for cooking.

At the close of this period of fifteen weeks the cattle were all turned together and received an amount of corn equivalent to 18 pounds each, daily, with stalks on the ground for thirty-six days up to April 15, when they were sold. The following table gives the results for this latter period, and also the results for the entire period of experiment:

Number.	Weight when sold, April 15.	Sales at $5.50 per hundred.	Gain in weight during 36 days on corn fed in yard.	Cost of feeding, 36 days.	Gain over cost of feeding, 36 days.	Total gain in weight, 141 days.	Profit, 141 days.
	Lbs.		*Lbs.*			*Lbs.*	
1	1,330	$73 15	75	$2 94	$10 59	175	$7 25
2	1,380	75 90	105	2 94	12 40	160	7 23
3	1,370	75 35	95	2 94	11 80	225	......
4	1,360	74 80	30	2 94	8 69	205	......
5	1,430	78 65	70	2 94	11 11	195	10 91
6	1,310	72 05	45	2 94	9 03	165	8 14
7	1,440	79 20	65	2 94	10 94	215	13 63
8	1,330	73 15	45	2 94	9 18	195	11 41
9	1,500	82 50	40	2 94	10 21	245	15 41
10	1,330	73 15	15	2 94	7 74	185	10 74
11	1,550	85 25	60	2 94	11 55	175	14 80
12	1,390	76 45	30	2 94	8 91	175	12 80
13	1,230	67 65	65	2 94	9 38	185	11 23

The table shows great differences in the gains of the several animals during this period of 36 days.

The result of the other experiment points to the non-advisability of cooking meal for feed, and especially where corn bears a low price. But the exhibit should be modified by the following considerations: The "profit, 141 days," is derived from the increased value per pound on the whole animal—not merely on the gain in weight—and therefore the heavier animals have an advantage over the others throughout. For example, the excess of profit of No. 11 over No. 1 (each making a total gain of 175 pounds in weight) should rather be represented by $4.81, the difference in total cost of feed, than by $7.55, as shown by the last column of the second table. Furthermore, as to the profit and loss account of the first 15 weeks, the experimenter remarks that the sale-price would indicate that his valuation of March 10 was somewhat too low. It is questionable, therefore, whether there was actually a loss incurred on any of the animals at the close of the 15 weeks. Evidently the method in which the tables are made up gives a disproportionate exhibit of profit for the last 36 days, as compared with the exhibit for the first 15 weeks.

COOKED AND UNCOOKED MEAL FOR HOGS.—Mr. Charles Heritage reported to the Greenwich Township Farmers' Club, New York, in December, 1872, an experiment in feeding two hogs and three pigs seven and a half months old. The animals had received corn for about two weeks before the commencement of the experiment, but had had none during the summer. In making the experiment, the hogs were placed in separate pens. Hog No. 1 was fed on scalded meal, given cold; hog No. 2 on uncooked, moistened meal; the pigs were fed in the same manner as No. 1. The table gives the weight of the animals at different periods of the experiment, with the number of pounds of meal required to make one pound of live weight; also the weight of the animals at time of

slaughtering, which was 48 days after the commencement of the experiment.

Hogs.	Weight at commencement of experiment.	Gain in 12 days.	Pounds meal for 1 pound live weight, 12 days.	Gain in 14 days.	Pounds meal for 1 pound live weight, 14 days.	Gain in 22 days.	Pounds meal for 1 pound live weight, 22 days.	Gain for whole period of 48 days.	Pounds meal for 1 pound live weight, average for whole period.	Weight at close of experiment.	Net weight slaughtered.	Per cent. loss from live weight.
	Lbs.	*Lbs.*		*Lbs.*		*Lbs.*		*Lbs.*		*Lbs.*	*Lbs.*	
Hog No. 1	574	30	5.5	49	4.0	43	6.7	122	5.3	696	605	13.2
Hog No. 2	470	54	3.5	44	4.7	58	4.8	156	4.4	626	555	11.3
Three pigs	962	60	5.2	96	4.3	60	9.0	216	5.9	1,178	1,025	13.0

The fat of No. 2 was much less oily than that of the other animals.

CORN IN EAR VERSUS CORN-MEAL.—The following is an abstract of an experimental statement in the Iowa agricultural report for 1872: Ten pigs, about four months old, were placed in pens September 4; in pen 1, two "native" pigs, in pen 2, two Berkshires, in pen 3, two Chester Whites, in pen 4, two pigs three-quarters Chester White and one-quarter Berkshire, in pen 5, two pigs three-quarters Chester White and one-quarter Suffolk. In another pen was placed one large hog three-quarters Chester White and one-quarter Suffolk. From September 4 to October 19, each pen received 7½ bushels of new corn in ear; from October 19 to November 3, 79 pounds of oats, soaked in cold water; from November 3 to December 3, 305 pounds of unbolted corn-meal moistened with cold water. The results are here shown in tabulated form:

Pen.	Breeds.	Fed on corn in the ear.						Fed on oats soaked in cold water.			Fed on corn-meal, moistened with cold water.				Total gain, September 4 to December 3.	Average value realized for grain, per bushel.
		Weight, September 4.	Weight, September 19.	Weight, October 4.	Weight, October 19.	Gain up to October 19.	Value realized for grain, per bushel.	Weight, November 3.	Gain, October 19 to November 3.	Value realized for grain, per bushel.	Weight, November 19.	Weight, December 3.	Gain, November 3, to December 3.	Value realized for grain, per bushel.		
		Lbs	*Lbs*	*Lbs*	*Lbs*	*Lbs*	*Cents*	*Lbs*	*Lbs*	*Cents*	*Lbs*	*Lbs*	*Lbs*	*Cents*	*Lbs*	*Cents.*
1	Native.	48 61	62 78	80 86	98 104	93	43.00	102 120	20	29.25	118 140	124 158	20	38.80	173	30.43
2	Berkshire.	62 82	90 116	104 132	120 148	124	57.40	130 160	22	32.17	150 176	158 188	56	36.00	202	45.86
3	Chester white	90 88	116 104	132 114	148 130	100	46.00	162 138	22	32.17	186 158	184 174	58	37.25	180	41.00
4	¾ Chester wht. ¼ Berkshire	88 96	106 116	124 128	142 138	96	44.80	158 152	30	43.87	182 172	196 180	66	42.40	192	41.50
5	¾ Chester wht. ¼ Suffolk.	76 72	102 92	114 108	130 120	102	47.60	144 132	26	39.14	170 154	186 162	72	46.25	200	45.64
6	¾ Chester wht. ¼ Suffolk.	330	362	380	390	60	28.00	416	26	39.14	452	448	32	20.50	118	26.90

The following table shows the gain of the pigs in weight during each 15 days of the experiment, the exhibits for 16 days and 14 days of the original report being converted into approximate exhibits for periods of 15 days. It should be borne in mind that, other things being equal, the greatest proportionate gain in weight is to be expected during the ear-

liest period of feeding; also, that the younger the animal the greater the gain in weight for each pound of food properly administered.

Pen.	Weight, September 4.	Fed on corn in the ear.			Fed on oats soaked in cold water.	Fed on unbolted corn-meal moistened with cold water.	
		Gain, 15 days.	Gain, 15 days.	Gain, 15 days.	Gain, 15 days.	Gain, 15 days.	Gain, 15 days.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	109	31	26	36	20	34	26
2	144	62	30	32	22	34	22
3	178	42	26	32	22	42	16
4	184	38	30	28	30	42	24
5	148	46	28	28	28	46	26
Total	763	219	140	156	120	198	114

COTTON.

COMMERCIAL AND HOME-MADE MANURES.—Mr. J. S. Newnan, of Georgia, reports an experiment made by direction of the Hancock County Agricultural Club for the purpose of comparing the effects of certain commercial fertilizers with the results obtained from home-made compounds. The trial was on thin stubble land of uniform fertility, unmanured since 1867. Two composts were prepared; one, known as the Logan compost, according to which 500 pounds of concentrated soluble phosphate is composted with 1,300 pounds of stable-manure, and 200 pounds of ashes added just before using. "An excellent manure, but very troublesome to manipulate according to directions." The other compost was, in modification of the Bryan formula, constituted of 1,400 pounds stable-manure, 300 pounds superphosphate, 200 pounds green cotton-seed, 60 pounds sulphate of ammonia, and 40 pounds nitrate of soda. The other applications were of commercial fertilizers, as named in the table given below. Each of the manures tested was applied under three rows, 70 yards long, and three rows in the center of the experimental field were left unmanured. Cotton was planted in dust, May 1, and germinated May 20. A stand being then obtained great care was taken to make it uniform in all the rows. The cotton suffered severely from drought from June 16 till July 6. The following table gives results for the season:

Fertilizers.	Amount applied per acre.	Cost of application per acre.	Yield of seed cotton per acre.	Excess of product over that from unmanured land.
	Pounds.		*Pounds.*	*Pounds.*
Logan compost	230	$1 38	675	180
Home compost	200	2 00	720	225
No manure	....	....	495	....
A. A. Ober	200	7 00	600	105
Ober's superphosphate	200	6 00	675	180
Pendleton	200	6 60	705	210
Zell	200	5 75	645	150
Atlantic phosphate	200	5 35	645	150
Five commercial fertilizers mixed	200	6 35	735	240

The following is a statement of results obtained in 1871 from three of these fertilizers:

Fertilizers.	Amount applied per acre.	Cost of application per acre.	Yield of seed-cotton per acre.	Excess of product of manured over that from unmanured land.
	Pounds.		*Pounds.*	*Pounds.*
Zell	200	$6 00	885	225
Home compost	200	2 00	915	255
Pendleton	200	7 20	900	240
No manure	....	....	660	....
Zell	100	3 00	885	225
Home compost	100	1 60	855	195
Pendleton	100	3 60	795	135

Averages of excess of manured over unmanured: Zell, 225 pounds; Home compost, 225 pounds; Pendleton, 187½ pounds, per acre. The experimenter holds that these results for two seasons of widely differing character indicate that these home-made fertilizers, possessing considerable carbonaceous matter, act better on soils which have been deprived of much of their vegetable material by continued cropping in corn and cotton than do the concentrated commercial manures; the latter having peculiarly a chemical action on the soil, and adding to it little beside mineral elements, often effect injury in dry seasons. Judicious rotation and the turning under of green crops should be largely resorted to in bringing about the restoration of the soil.

Different quantities of fertilizers.—Mr. T. C. Law, of Hartsville, S. C., reports an experiment on high, level land, of poor quality, showing a capacity of 325 pounds of seed-cotton per acre, on unmanured soil. He employed the following fertilizers: Acid phosphate (Pacific) and green cotton seed, in equal proportions, the mixture applied in quantities of 400 pounds, 600 pounds, and 800 pounds per acre, costing $4.60, $6.40, and $9.20 per acre. Etiwan dissolved bone and green cotton seed, 200 pounds, 300 pounds, and 400 pounds of the former to 200 pounds of the latter per acre; cost of application $5.60, $8.40, and $11.20 per acre; 200 pounds of soluble Pacific guano and 200 pounds of green cotton seed per acre, cost, $6.60; soluble Pacific guano, alone, 200 pounds, 400 pounds, and 800 pounds per acre, costing $5, $10, and $20; Chincha Island guano, 200 pounds, 400 pounds, and 800 pounds per acre, costing $8.70, $17.40, and $34.80. The smaller or medium applications of fertilizers, in each class, gave the most net profit. Far the largest profit was derived from the plot dressed with 200 pounds of Chincha Island guano. On this plot the yield of seed-cotton was at the rate of 724 pounds per acre, net profit of excess over unmanured, after deducting cost of fertilizer, $11.25 per acre. The seed-cotton was valued at 5 cents per pound. The application of 400 pounds of this fertilizer resulted in a yield of 798 pounds of cotton and a net profit of $6.25 per acre; the application of 800 pounds, in a yield of 938 pounds of cotton, and a net loss of $4.15 per acre.

Methods of applying manures.—Mr. J. L. Coker, of Hartsville, S. C., reports an experiment made in 1872 in comparing broadcast applications of fertilizers for cotton with applications in the center furrow. The land having been well broken and harrowed, rows 70 yards long were laid off deeply with a shovel-plow May 7. On one plot four alternate rows

received an application costing $17.70 per acre, and compounded according to the following proportions per acre: Dissolved bone 400 pounds, cotton-seed 400, Guanape guano 200 pounds. The four intervening rows were left unmanured. On another plot four alternate rows received an application of the same description as above mentioned, but the application was made in the center furrow. On the first plot the manured rows produced 1,250 pounds of seed-cotton per acre, against 400 pounds from the unmanured, showing an excess of 850 pounds for the manured, worth $48.11; net profit from fertilizer, $30.41. On the second plot, the manured rows gave 1,575 pounds of seed-cotton per acre, and the unmanured 300 pounds; excess of manured over unmanured 1,275 pounds, making the net profit from the fertilizing application $54.55 per acre, and showing an advantage of $24.14 per acre over the results of the broadcast application. In making his statement the experimenter rated three pounds of seed-cotton as equivalent to one pound of lint, worth 17 cents.

In another experiment, for the purpose of comparing deep and shallow applications of fertilizers, alternate rows of one plot received per acre 105 pounds Etiwan dissolved bone, and 52½ pounds Guanape guano, costing $3.85, the application being made in the center furrow. Product of seed-cotton, per acre, from the manured rows, 530 pounds, against 213 pounds per acre from the unmanured rows; excess of manured over unmanured, per acre, 317 pounds, worth $17.85; net profit from fertilizers, $14. On another plot a fertilizer of the like description and amount was sprinkled on the top of alternate rows, and carefully incorporated in the surface-soil by raking. The manured rows gave 385 pounds of seed-cotton per acre, against 265 pounds per acre from the unmanured rows; net profit from application, $2.95, showing an advantage of $11.05 in favor of the deeper application.

SUBSOILED AND NOT SUBSOILED.—In 1872 a Georgia planter laid out plots containing rows 70 yards long and 3 feet wide, uniform in character of soil. Plot 1 received no manure, and was not subsoiled. It yielded at the rate of 385 pounds of seed-cotton per acre. Plot 2, subsoiled but not manured, yielded 367 pounds per acre. Plot 3, not subsoiled, dressed with 200 pounds of Whann's guano per acre, yielded 1,015 pounds of seed-cotton per acre. Plot 4, subsoiled and dressed with the same description and amount of fertilizer, yielded 703 pounds of seed-cotton per acre. The preparation of plot 5 is not definitely stated. Plot 6, not subsoiled, was dressed with cotton-seed and acid phosphate, mixed in equal proportions, the application being at the rate of 500 pounds of the mixture per acre; yield of seed-cotton, 858 pounds per acre. Plot 7, subsoiled, received a like application, and yielded 735 pounds of seed-cotton per acre. Plot 8 was neither subsoiled nor manured, and its preparation differed from that of any one of the other plots, in the fact that the bed was formed on hard ground by throwing two furrows together; yield of seed-cotton per acre, 682 pounds. The character of the soil of the field seems to be indicated in the experimenter's conclusion, "that it will not do to subsoil light, sandy land."

THE ROTHAMSTED EXPERIMENTS, ENGLAND.

Messrs. Lawes and Gilbert, in their recent reports on the results of experiments on wheat and barley grown for many successive years on the same ground, renew the statement that the experimental soil is a rather heavy loam, with a subsoil of raw, yellowish-red clay, underlaid with chalk, which provides good natural drainage. The wheat-field is

pipe-drained; the barley-field is not. Thirty successive wheat-crops have been taken at Rothamsted on the same land, the crop still showing no deterioration in quantity or quality where suitable manures have been applied.

The following table gives certain results of the wheat experiments. The results exhibited are for plot 3, unmanured; plot 2, receiving yearly 14 tons farm-yard manure per acre; plot 7, receiving yearly, per acre, 200 pounds sulphate of potash, 100 pounds sulphate of soda, 100 pounds sulphate of magnesia, 392 pounds superphosphate of lime, (made from 200 pounds bone-ash, 150 pounds sulphuric acid of 1.7 specific gravity, and water,) 200 pounds sulphate of ammonia, and 200 pounds muriate of ammonia; plot 8, receiving the same dressing as plot 7, excepting that 300 pounds sulphate of ammonia and 300 pounds muriate of ammonia were used per acre; plot 9*a*, receiving the same amounts of sulphates of potash, soda, and magnesia, and superphosphate as plot 7, and instead of the 400 pounds per acre of ammonia salts, or sulphate and muriate of ammonia, 550 pounds of nitrate of soda, containing an equivalent of nitrogen. Results are stated in bushels of marketable grain.

Crops.	Bushels per acre.					Weight per bushel, pounds.				
	Plot 3.	Plot 2.	Plot 7.	Plot 8.	Plot 9*a*.	Plot 3.	Plot 2.	Plot 7.	Plot 8.	Plot 9*a*.
Yearly average, 1852-'62..	15. 3	34. 5	34. 8	36. 5	32. 6	55. 9	59. 0	58. 0	57. 5	56. 5
Yearly average, 1863-'73..	13. 3	35. 0	34. 0	39. 0	41. 4	59. 3	61. 0	60. 4	60. 5	60. 3
Crop of 1873..............	11. 8	26. 8	22. 0	27. 5	35. 9	57. 0	57. 1	58. 1	56. 9	57. 1

Reducing the products to bushels of 61 pounds, and comparing the latter period of eleven years with the former period, the following approximate percentages of increase or decrease of the yield of the respective plots is shown for the term 1863-'73: Plot 3, unmanured, 8 per cent. decrease; plot 2, receiving farm-yard manure, 8 per cent. increase; plot 7, 2 per cent. increase; plot 8, 12 per cent. increase; plot 9*a*, 35 per cent. increase.

As the yield of 1863 was exceptionally large, an exhibit is here offered for the periods 1853-'62 and 1864-'73:

Crops.	Bushels per acre.					Weight per bushel, pounds.				
	Plot 3.	Plot 2.	Plot 7.	Plot 8.	Plot 9*a*.	Plot 3.	Plot 2.	Plot 7.	Plot 8.	Plot 9*a*.
Yearly average, 1853-'62..	15. 4	35. 3	35. 6	37. 3	33. 3	55. 9	59. 0	58. 2	57. 5	56. 7
Yearly average, 1864-'73..	12. 9	35. 2	32. 0	37. 3	40. 0	59. 0	61. 0	60. 2	60. 3	60. 1

Reducing to bushels of 61 pounds, and comparing the annual averages of the two periods, the following percentages of increase or decrease are shown for the ten years 1864-'73: Plot 3, 12 per cent. decrease; plot 2, 3 per cent. increase; plot 7, 7 per cent. decrease; plot 8, 5 per cent. increase; plot 9*a*, 27 per cent. increase.

The report contains these remarks in connection with the exhibit for twenty-two years:

Reduced to 61 pounds per bushel, the average produce of the selected plots in the experimental wheat-field in 1873 is about 24 per cent. below the average of twenty-two years. Much of this great deficiency is due to the fact that there was, in all, about

double the average fall of rain during the four months of October, November, December, and January, the effect of which would be to wash beyond the reach of the roots a large amount of the nitrogenous manure which had been applied in the autumn. It is established that the most important and costly constituent of manure, nitrogen, especially when applied in the soluble form of ammonia, is largely converted into nitrates in the soil, and is, in that condition, washed away into the drains or the subsoil when there is an excess of rain. The loss of effect thus arising is strikingly illustrated by a comparison of the produce of the two plots, No. 7 and No. 9, [9a.] Both received the same amount of nitrogen per acre, which was applied as ammonia salts in the autumn to plot 7, and as nitrate of soda in the spring to plot 9. The result was that while the autumn-sown ammonia salts yielded 22 bushels the spring-sown nitrates yielded nearly 33 bushels. Again, another plot which received the same amount of ammonia salts as plot 7, but applied in the spring instead of the autumn, yielded nearly 33 bushels.

The loss of the nitrogen of manure by winter drainage would be the greatest where guano, ammonia salts, or other very soluble nitrogenous manure was sown in the autumn, less where farm-yard manures are employed, and still less where wheat was grown after clover.

The following is from the barley experimental tables for 20 years 1852–'71. The "mixed mineral manure" was composed, per acre, of 200 pounds sulphate of potash, 100 pounds sulphate of soda, 100 pounds sulphate of magnesia, and 392 pounds superphosphate of lime.

Plots.	Manures per acre.	Average annual product of marketable barley per acre, bushels of 52 lbs.			Increase or decrease in second ten years as compared with first ten years.
		Ten years, 1852–'61.	Ten years, 1862–'71.	Entire period of 20 years.	
					Per cent.
1 O....	Unmanured	22.3	18.0	20.2	Decrease 19.3
2 O....	392 pounds superphosphate	28.2	24.3	26.3	Decrease 13.8
4 O....	"Mixed mineral manure"	30.9	25.7	28.3	Decrease 16.8
1 A....	200 pounds ammonia salts	33.3	32.0	32.7	Decrease 3.9
4 A....	200 pounds ammonia salts, with "mixed mineral manure"	46.7	49.8	48.2	Increase 6.6
7	14 tons farm-yard dung	45.9	55.6	50.7	Increase 21.1
4 AA..	Mixed mineral manure and { 400 lbs. ammonia salts, 1852–'57; 200 lbs. ammonia salts, 1858–'67; 275 lbs. nitrate of soda, 1868–'71 }	49.3	53.2	51.3	Increase 7.9

The farm-yard manure.—The 14 tons of farm-yard dung gave an excellent crop, though not quite equal to the yield obtained through some of the artificial manures, and it is to be observed that, during the second ten years of the barley experiments as compared with the first ten years, the farm-yard manure gave a greater increase of crop than did any other application. Only a small proportion of its nitrogen was recovered in increase of product during years of application, but its continued use accumulated a large amount of organic matter in the soil, making the latter more porous and absorptive of moisture, and consequently more secure against injury from excessive rains on the one hand and injury from drought on the other. Where the like application had been made for wheat for twenty-five consecutive years, the upper 9 inches of soil were found to contain nearly twice as large a percentage of nitrogen as the corresponding layers of artificially manured plots, which, receiving a much smaller amount of nitrogen than the dunged plot, yet gave a larger yield than the latter. As will be definitely illustrated farther on, there remains a large amount of the nitrogen of the dung not satisfactorily accounted for. Sufficient data have not as yet been collected to

show whether the ultimate loss of the nitrogen supplied will be greater or smaller than in the cases of the ammonia salts and the nitrate of soda.

The mineral manures.—The general result with the purely mineral manures was that the superphosphate of lime gave more increase of barley than a mixture of potash, soda, and magnesia; but neither application, nor a mixture of the two, produced a fair crop; furthermore, with these dressings the yield decreased considerably in the later years. On wheat the mixed mineral manure gave even less favorable results than on barley. It appears, therefore, that the exhaustion which the soil suffered through continuous cropping was not connected with a deficiency of any of the constituents represented in the mineral manures, but rather with a consumption of nitrogen stored in the soil from previous manuring and cultivation. A liberal provision of mineral constituents is indeed essential, but the amount of product of the experimental fields was more dependent on the supply of available nitrogen within the soil than that of any other constituent.

The nitrogenous element in artificial manures.—As to the comparative importance of nitrogenous and mineral elements of artificial manures, Mr. Lawes states his conviction, founded on a very wide acquaintance with the experience of farmers in all parts of Great Britain in applying artificial manures, that almost invariably where wheat is grown in ordinary rotation there is an excess of supply of immediately available mineral constituents, as compared with the supply of immediately available nitrogen.

Applications of superphosphate.—The effect of a given amount of ammonia is influenced greatly by the character of the mineral constituents supplied with it, and the results of the experiments agree with common experience in indicating the efficiency of superphosphate of lime provided there be a sufficient supply of nitrogen in the soil. But applications of superphosphate are generally much more effective with spring-sown than with winter-sown crops; the former, having the quicker growth and the greater dependence on root development near the surface, make larger calls on the resources contained within a limited extent of soil.

Examining the Rothamsted reports of different dates, we find that yearly applications, per acre, on barley, of 200 pounds ammonia salts with 392 pounds superphosphate of lime returned, per acre, during the ten years 1852–'61 an annual average of 45.7 bushels of 51.8 pounds average weight, and during the next ten years, 1862–'71, an average of 48.4 bushels of 55.1 pounds average weight. Average of unmanured soil per acre for 1852–'61, 22.4 bushels of 51.6 pounds, and for 1862–'71, 17.5 bushels of 53.1 pounds. The wheat record for the twenty years 1844–'63 shows that for that period an annual application per acre of 400 pounds ammonia salts and 392 pounds superphosphate returned, per acre, a yearly average of 29.2 bushels of 58.3 pounds average weight, exhibiting an excess of 9 bushels over the average of the unmanured soil. This excess of average was about the same for the two included decades.

Relative requirements of nitrogen.—It is concluded that on soil of the indicated character, under good management, making exhibit for a term of years, an average approximate increase of 52 pounds of grain and 63 pounds of straw may be expected for every 1.65 pound to 1.85 pound of nitrogen, or its equivalent of 2 pounds to 2.25 pounds of ammonia applied for barley in moderate dressings of sulphate of ammonia, nitrate of soda, Peruvian guano containing 12 per cent. of ammonia, or in similar commercial manures, in connection with a suitable supply of

mineral constituents. For winter-wheat, under like conditions, an approximate to 5 pounds of ammonia would be required, on an average, for production of an increase of 61 pounds of grain and 105 pounds of straw. When, instead of such dressings, sheep-folding or farm-yard dung is used, a much larger proportion of applied nitrogen is required toward one bushel of grain-increase of wheat or barley.

Unrecovered nitrogen of manures.—For the twenty experimental years 1852–'71, with continued dressings of the mixed mineral manure and 200 pounds of ammonia salts containing 41 pounds of nitrogen, only one-third of the applied nitrogen was recovered in increase of the wheat-product, and not quite one-half in increase of the barley-product. Where, on wheat, this course of manuring was interrupted by ceasing wholly or in part the nitrogenous applications on certain plots, the nitrogen not recovered during the years of application yielded scarcely any increase in subsequent seasons; but with barley, under like circumstances, a considerable increase was realized from the residue of nitrogen.

The following is a statement of nitrogen contained in the exhibited amounts of ammonia salts used annually on wheat for twenty years, in connection with the mixed mineral manure already described, and the proportions of nitrogen not recovered in increase of grain and straw during the period of application; manurial amounts are represented in quantities per acre: On plot 6, 200 pounds ammonia salts, containing 41 pounds of nitrogen; on plot 7, 400 pounds ammonia salts, containing 82 pounds of nitrogen; on plot 8, 600 pounds ammonia salts, containing 123 pounds of nitrogen—percentages of nitrogen recovered, 32.4, 32.9, 31.5, respectively. On plot 16, which received annually for thirteen years with the mixed mineral manure, 800 pounds of ammonia salts per acre, 28.5 per cent. of the nitrogen were recovered during the period of application. Plot 9*a* received, per acre, with the mixed mineral manure, in 1852, 475 pounds nitrate of soda, containing 71 pounds of nitrogen; in 1853 and 1854, 275 pounds nitrate of soda; and from 1855 to 1871, yearly, 550 pounds nitrate of soda; percentage of nitrogen recovered during the twenty years, 45.3. Plot 2 received annually, for twenty years, 14 tons farm-yard manure per acre, estimated to contain 200 pounds of nitrogen; per cent. of the nitrogen recovered during the twenty years, 14.6.

Exhibit of certain annual manurial applications, per acre, of the barley experiments, and the percentages of their nitrogen recovered during the entire period of application: Plot 4 A, mixed mineral manure and 200 pounds ammonia salts, recovered nitrogen 48.1 per cent. Plot 4 AA, mixed mineral manure and, 1852–'57, 400 pounds ammonia salts; 1858–'67, 200 pounds ammonia salts; 1868–'71, 275 pounds nitrate of soda—recovered nitrogen, 49.8 per cent. Plot 7, 14 tons farm-yard dung, recovered nitrogen, 10.7 per cent.

Causes of loss of nitrogen.—Analyses of samples of soil from differently manured wheat-plots, taken down to the depth of 27 inches, showed that a considerable part of the nitrogen unrecovered in the crops had accumulated within the soil, and that of the yet larger remaining portion of the unrecovered nitrogen some had passed off by the drains and some into the lower subsoil. The loss by drainage was especially marked in the case of the autumn applications of ammonia salts for wheat.

Wastage of nitrate of soda.—Nothwithstanding the ready solubility of nitrate of soda, and its consequent liability to loss by drainage, it was found that its frequent application resulted in a disintegration and increased porosity of the clay subsoil, counteracting to a considerable

degree the tendency to wastage of nitrogen. For by this disintegration a larger volume of soil was brought to bear for retention of nitrates, and at the same time there was an enlarged capacity for storage of moisture available against drought. The barley-plots which had been dressed continuously with nitrate of soda were found much more independent of drought than those which had received an equal amount of nitrogen in ammonia salts. The full effect of the nitrate of soda was not obtained until it had been applied for several years, a fact which controverts a common opinion as to the working of this fertilizer. On the other hand, where this nitrate has been used for many successive years on some of the plots at Rothamsted, a disadvantage has arisen in the surface-soil retaining so much moisture as to be worked with difficulty after wet weather.

Potash and phosphoric acid.—The wheat experiments have given conclusive evidence of the marked effect of potash and phosphoric acid when, twenty years after their application, they were made available by applications of nitrogenous manures. The analyses of soil have shown that these mineral elements supplied to the soil suffer comparatively little loss by drainage. It is concluded that, at least in the heavier soils, these important constituents for growing grain and meat are almost wholly retained within reach of plant-roots.

Autumn and spring applications of nitrogen.—Experimental results lead to the conclusion that, on account of the greater liability to loss of nitrogen during late autumn and winter months, sulphate of ammonia and Peruvian guano, as well as nitrate of soda, should be applied in spring; on winter-wheat as a spring top-dressing.

GERMAN EXPERIMENTS.

FORTY-FIVE YEARS OF EXPERIMENT.—The experiments by Christiani in comparing the effects of different quantities of manure upon the soil with the results obtained from soil of similar character unmanured were commenced in 1827, and since the death of the elder experimenter in 1855 have been continued by his son, Wilhelm Christiani. The field of their investigations is in Oderbruch, a rich and fertile tract, about thirty-three miles long by fourteen miles wide, lying in the Brandenburg March, and but a short distance from Berlin. Oderbruch, which now presents a striking contrast to the sandy region which surrounds it, was reclaimed from the ancient marshes under the auspices of the Hohenzollerns, especially Frederick the Great. These marshes had been the resort of fishermen, who had their huts on the more elevated spots, with shelter for their domestic animals, and the accumulating dung of the latter was used for inclosures of dwellings and for filling up depressions in the earth. The low-lying expanse of marsh was varied by beds of clay or sand deposited by the currents of traversing streams. Certain variations of soil found in later years and indicated in the Christiani experiments are traceable to these circumstances of history. Stock-feeding is a prominent industry in Oderbruch, and for this purpose sugar-beets are now largely used, instead of potatoes as formerly. There were 17 beet-sugar factories in Oderbruch at the beginning of 1872.

The elder Christiani, in commencing his course of experiment, set apart three plots which were treated as follows: Plot 1 received no manure; plot 2 received an application of 19.6 tons (of 2,000 pounds) of cow-dung, per acre, every four years; plot 3 received 29.4 tons of dung, per acre, every four years. During forty-five years the following variations have been made from the original plan: In 1859, plot 1 was sub-

divided; one-half, designated as 1*a*, remained unmanured, the other half, 1*b*, receiving 58.8 tons of dung per acre every three years, until the soil, comparatively exhausted by thirty-two crops without manure, regained its original productiveness. This point was attained on the second extra-heavy application, made in 1862. In 1865 it received the medium application of 19.6 tons per acre, and again in 1868. Plots 2 and 3 received their above stated amounts of manure (19.6 tons and 29.4 tons, per acre) once every three years from 1859 to 1867 inclusive, and once for the 4 years from 1868 to 1871, inclusive.

During the thirteen years from 1859 to 1871 the manurial applications exhibited by annual averages were, per year and per acre: 1*a*, nothing; 1*b*, from 1859 to 1864, 19.6 tons; from 1865 to 1871, 5.6 tons; plot 2, 6 tons; plot 3, 9 tons. From 1827 to 1850 the plots were subjected to rotations of potatoes, barley, oats, wheat, &c., grain largely predominating; from 1851 to 1871, to rotations of sugar-beets, barley, &c., roots predominating.

The following particulars of crops will serve to illustrate the original richness of the soil, the gradual removal of plant-food from unmanured soil continuously cropped, the comparative effects of different amounts of manure during a course of years, and the large difference of profit of certain farm-crops grown on enriched land: From 1827 to 1849 there were six potato-crops. In the former year the products of the three plots, reckoned per acre, were, respectively, 267 bushels, 321.4 bushels, and 267 bushels; averages of the six crops, 242.3 bushels, 284.3 bushels, and 294.2 bushels. There were five oat-crops from 1829 to 1851. The yield for 1829 was about the same in amount throughout the various plots, namely, 102.1 bushels per acre. For 1851 the several products were, per acre, 64.3 bushels, 80.8 bushels, 85 bushels; averages for the five crops, 79.8 bushels, 85.8 bushels, 89.7 bushels. From 1828 to 1855 nine crops of barley were taken, the intervals being generally three or four years. The products in the former season were, per acre, 70.5 bushels, 75.6 bushels, and 80.6 bushels, and the yields decreased till in the latter year they amounted, per acre, to 31.4 bushels, 39.6 bushels, and 44.5 bushels. Averages of the nine crops, 53.9 bushels, 61.3 bushels, 61.8 bushels. From 1861 to 1869 there were four crops of barley; the unmanured division of plot 1 averaged, in yield, per acre, about 39 bushels, the manured, 54 bushels; averages of plots 2 and 3, 56 bushels and 51 bushels per acre. From 1837 to 1848 there were four wheat-crops. In the former year the plots yielded, respectively, per acre, 46.2 bushels, 49.4 bushels, and 48.2 bushels; in the latter season, 32.9 bushels, 32.9 bushels, and 36.8 bushels. Averages of the four crops, 39.8, 42.3, and 44.2 bushels. From 1852 to 1857 there were five crops of sugar-beets. The three plots yielded, the first year, per acre, 13.3 tons, 18.7 tons, and 20.9 tons, of 2,000 pounds. Excluding the crop of the latter year as being exceptionally small, the averages of four crops were, per acre, 12 tons, 15.9 tons, and 18.7 tons. In 1859, subdivision 1*a* gave, per acre, 11.8 tons, 1*b*, 18.3 tons, and plots 2 and 3, 18.2 and 19.5 tons per acre. Six crops of sugar-beets were afterward taken, up to 1868, inclusive, in which year the yields were, respectively, per acre, 4.2 tons, 13.8 tons, 14.3 tons, 14.5 tons. Averages for the seven crops, 6.6 tons, 18.2 tons, 16.4 tons, and 17.8 tons.

In order to an exhibit of the value of the increase arising from the manurial applications of different dates, it is found convenient to represent the various crop amounts by equivalents of some one description of grain. One bushel of wheat being taken as the unit of value, one bushel of barley is represented by .8, of oats by .5, of potatoes by .29, while one ton of sugar-beets is made equivalent to 3.3 bushels of wheat.

Dividing the forty-five years into two periods, the first of twenty-four years and six manurings, the second of twenty-one years and six manurings, (in which latter period roots predominated,) the following values of one ton of manure are shown in comparing plot 2 with plot 1: Value returned in the first period, equivalent to 1.7 bushel of wheat, in the second period, to 7.6 bushels of wheat. Comparing the more heavily manured plot 3 with the unmanured plot 1, one ton of manure returned the value of 1.5 bushel of wheat during the first period, and during the second period the value of 6.1 bushels of wheat. Comparing plot 3 with plot 2, in order to obtain the value returned by the excess of manure on the former plot over the amount applied on the latter plot, it appears that one ton of such excess during the first period gave only the value of 1 bushel of wheat, but that during the second period, when sugar-beets were largely grown, each ton of such excess of manure returned the value of 3.1 bushels of wheat. It will be perceived that, notwithstanding the natural richness of the land, 1*a*, remaining unmanured, was so affected by repeated root-crops that in 1868 it yielded only about 4 tons of beets per acre, a crop insufficient to pay the cost of management. Yet this portion, which had been cultivated under the various crops named for over 40 years without manure, still gave good crops of grain in the latter years of experiment, producing, per acre, in 1869, 50 bushels of barley, in 1870, 35.3 bushels of wheat, and in 1871, 56.1 bushels of oats; or, by weight, respectively, 2,476 pounds, 2,040 pounds, and 2,092 pounds. The soil of the experimental grounds was naturally so rich that with the crops grown during the first twenty-four years the manurial applications were unremunerative. During the ensuing period, when the strong feeding root-crops were introduced, better returns were obtained.

In 1856 carefully selected samples of the soil were subjected to analysis at the Tharand laboratory, Dr. Peters conducting the investigation, assisted by Drs. Hellriegel and Storer. The following table shows the proportions in 100,000 parts of soil of certain important constituents in plots 1 and 3.

Samples of soil.	Total nitrogen.	Nitrogen, as ammonia and nitric acid.	Potash.	Carbonate of lime.	Carbonate of magnesia.	Phosphoric acid.	Sulphuric acid.	Silicic acid.
SOLUBLE IN ACID AND WATER.								
Surface-soil.	*Parts.*	*Parts.*	*Parts.*	*Parts.*	*Parts.*	*Parts.*	*Parts.*	*Parts.*
Plot 3	194	12.6	181	515	352	169	....	149
Plot 1	138	6.9	100	414	357	117	....	140
Difference	56	5.7	81	101	—5	52	....	9
Lower-soil.								
Plot 3	164	8.0	146	502	353	179	....	....
Plot 1	129	5.7	94	424	366	117	....	....
Difference	35	2.3	52	78	—13	62	....	....
SOLUBLE IN WATER.								
Surface-soil.								
Plot 3	....	9.2	49	11	1.4	1.9	7	53
Plot 1	....	3.5	25	10	1.8	1.1	5	28
Difference	....	5.7	24	1	—0.4	0.8	2	25
Lower-soil.								
Plot 3	....	....	39	9	1.4	1.6	6	51
Plot 1	....	....	26	11	2.6	1.1	5	29
Difference	....	....	13	—2	—1.2	0.5	1	22

After the barley-crop of 1869, samples of the soil and of the grain, chaff, and straw were sent to the Dahme experimental station for analysis. The results of the investigation there made (1872) are tabulated as follows, the soil-elements being represented in proportions of 100,000:

Samples of soil.	Total nitrogen.	Nitrogen, as ammonia and nitric acid.	Potash.	Carbonate of lime.	Carbonate of magnesia.	Phosphoric acid.	Sulphuric acid.	Silicic acid.
	Parts.	*Parts.*	*Parts.*	*Parts.*	*Parts.*	*Parts.*	*Parts.*	*Parts.*
Plot 3	340	18.2	244	614	617	262	36	252
Plot 1	288	12.8	208	481	467	233	34	275
Difference	52	5.4	36	133	150	29	2	—23

Analysis of the barley product showed in proportions of 100:

Samples of soil.	GRAIN.		CHAFF.		STRAW.	
	Nitrogen.	Potash.	Nitrogen.	Potash.	Nitrogen.	Potash.
Plot 3	2.498	0.505	1.027	0.480	1.198	1.225
Plot 1	2.465	0.585	0.748	0.395	0.810	0.758
Difference	0.033	—0.080	0.279	0.085	0.388	0.467

A difficulty arises in undertaking a direct comparison of these soil analyses of different periods. The statement for 1869 is much larger, plot for plot, in its exhibited proportions of the named elements of plant-food than that for 1856, and by its showing it would appear that in 1869 the unmanured plot contained a larger amount of these elements than did even the heavily manured plot thirteen years before. The report leaves the difficulty unexplained, but provides a method of collation in which are shown the relations borne by plot 1 to plot 3 at each of the two periods, in respect to the contained amount of these constituents. This mutual relation is set forth in the following table:

Plot 1.—Per cent. as compared with plot 3.

Elements.	REPORT, 1856.		REPORT, 1872.
	Soluble in acid and water.	Soluble in water.	Soluble in acid and water.
Nitrogen, total	71.1	....	84.7
Nitrogen as ammonia and nitric acid	55	38	70.3
Potash	55.3	51	85.3
Carbonate of lime	80.3	91	78.3
Carbonate of magnesia	101	128	75.6
Phosphoric acid	70	58	89
Sulphuric acid	....	71	....
Silicic acid	94	53	109

In 1852, its first season in sugar-beets, plot 3 yielded 20.92 tons of beets per acre, against 13.34 tons per acre from the unmanured plot. In 1853 these two plots yielded, respectively, per acre, 20.4 tons and 12.9 tons; in 1854, 19.26 tons and 11.85 tons, showing year by year a differ-

ence in favor of the manured plot of between 7 and 8 tons. After 1859 the yield of the unmanured plot steadily decreased till, with the twelfth and thirteenth beet-crops, 1866 and 1868, the amount did not reach 4.5 tons per acre, against an average of 15.93 tons per acre from plot 3, showing a difference of about eleven and one-half tons in favor of the latter. In fact, as before stated, the crop on the unmanured plot did not repay the cost of management. Yet the analysis of a little later date shows that the soil of the plot was even then quite rich in nitrogen, potash, and phosphoric acid. The unremunerative root-crop cannot therefore be attributed to an absolute deficiency in either of these elements. An explanation is found in the fact that, although in the earlier analysis all the samples of soil showed a strong acid reaction, in the later analysis it was observed in respect to plot 1 that there was not a sufficient neutralization of the acids existing in the abundant humus of the soil; a condition presumably owing to a relative deficiency of lime, &c. The circumstances of the case indicate the propriety of applying lime on the unmanured plot in order to restore its capacity for root production.

Notice is specially recalled to the fact that land which had been cropped for thirty-two years without manure, and which had consequently suffered much in point of productiveness, was, by dungings averaging not quite 20 tons annually, brought in about four years to an equality with the continuously manured plots.

MISCELLANEOUS.

FERTILIZERS ON WHEAT.—The following is an abstract of a report by the superintendent of the eastern experimental farm of the Pennsylvania Agricultural College, on experiments made at the farm in 1872-'73 in fertilizing wheat. The land was a wheat-stubble ground, on which barn-yard manure had been used for the preceding crop. Plots were set apart, each containing one-eighth of an acre, and the fertilizers, at a cost of $12.50 per acre, were applied on the surface, and harrowed in, September 14, 1872. September 18, Fultz wheat was drilled in, in rows two feet apart, at the rate of one and one-half bushel per acre. The accompanying table shows the fertilizers applied and the results obtained:

Plots.	Fertilizers.	Straw per acre.	Grain per acre.
		*Tons.**	*Bush.*
1	Bone and ashes compost	1.38	30.46
2	Dissolved South Carolina rock	1.59	34.30
3	Kainit, or German potash salts	1.35	29.73
4	Professor Ville's wheat-food	1.68	33.46
5	Nothing	1.28	25.33
6	Ground bone on surface	1.42	29.63
7	Ground bone, one-half on surface, one-half drilled in with the wheat	1.60	31.73
8	Ground bone, all drilled in with the wheat	1.79	33.60

*2,000 pounds.

The bone and ashes compost was made of one ton of ground raw bone, 340 pounds of sulphuric acid, and 50 bushels of unleached tan-ashes. The South Carolina rock was treated with 700 pounds of sulphuric acid to one ton of rock, and cost $30 per ton. Ville's "wheat-food" was made as follows for one-eighth of an acre: 20 pounds pure bone phosphate, 10 pounds saltpeter, 12½ pounds of sulphate of ammonia, 15 pounds of calcined plaster. The "dissolved South Carolina rock" did better on grass than any other of twenty fertilizers used.

WHEAT EXPERIMENT.—Mr. F. E. Miller, superintendent of the Kansas Agricultural College Farm, reports an experiment with wheat in 1872-'73, on a "medium upland-clay," sloping very gently toward the north and east. The field had been under cultivation about twelve years, chiefly in corn, without manure, the stubble burned each year. The crop preceding the experiment was corn, cockle-bur, and stramonium. In preparation for the experiment the old stalks were cut and turned under, together with a rank growth of weeds, and the field was laid out in seven plots running east and west, and immediately thereafter, May 25, 1872, plots 1 and 3 were sown with Hungarian grass. The other plots were left fallow. Of these plot 2 received no manure; plots 7 and 6, after plowing, were heavily dressed with green stable-manure, which on the former plot was soon afterward plowed under, and on the latter was incorporated with the soil by means of cultivators. Plot 5 received a heavy dressing of half-rotted stable-manure, which was worked under with cultivators.

About the first of August, plots 1 and 3 yielded 2½ tons to 3 tons of fine hay per acre, and were then plowed. The field in general (including these two plots, after removal of the hay) was harrowed and cultivated throughout the season, sufficiently to keep down weeds and maintain a fine, loose surface-soil. At the commencement of September, plot 3 was top-dressed with thoroughly rotted manure, which was harrowed in. At the same time plot 4 was top-dressed with 20 bushels of lime per acre. The entire field was sown, September 5 and 6, with May wheat, drilled in at the rate of a little more than one bushel of seed per acre. On plots 7, 6, 5, and 3 the wheat came up more evenly than on the other plots, and looked better at the close of winter, plot 4 ranking next in point of appearance. In the spring a considerable part of the wheat of plot 4 and the greater part of that of plots 1 and 2 were found frozen out. Harvesting was made tedious by excessive rains accompanied by high winds, and much of the grain was lodged, but all was cut with the aid of the Marsh harvester. Plot 5 suffered most from lodging, plots 6 and 7 coming next in order in point of injury from this cause, while plot 3 was affected but little in this way. The following table exhibits the results of the wheat-harvest:

Plots.	Area.	Preparation of soil.	Yield of wheat per acre.*	Gain per acre over plot 2.	Pounds of straw per acre.	Pounds of straw to one pound of grain.	Quality of grain.
	Acres.		*Bush.*	*Bush.*	*Lbs.*	*Lbs.*	
1	1.60	Hungarian grass-sod, unmanured.	9.44	1.37	2,802	5.0	Small grain and somewhat shrunken.
2	1.36	Summer fallow, unmanured.....	8.07	....	3,372	7.0	Small grain and somewhat shrunken.
3	1.28	Hungarian grass-sod, top-dressed with rotted-manure.	21.95	13.88	5,620	4.3	Plump and quite even.
4	1.32	Summer fallow, top-dressed with lime.	11.80	3.73	3,863	5.5	Small grain and somewhat shrunken.
5	1.10	Summer fallow, top-dressed with half-rotted manure.	21.36	13.29	10,982	8.6	Nearly equal to that of plot. 3.
6	0.66	Summer fallow, top-dressed with green stable-manure.	24.87	16.80	7,212	4.9	Medium, rank'g next to plots 3 and 5.
7	0.61	Summer fallow, top-dressed with green stable-manure.	27.38	19.31	10,142	6.2	Medium, rank'g next to plots 3 and 5.

*Bushels of 60 pounds.

Ranked according to best quality of grain, plot 3 stood first, plots 5, 7, 6, 1, 2, and 4 following in the order named. The wheat of plot 3 would grade with the best amber of the season; that from plots 5, 7, and 6 was of average market quality, while that of plots 1, 2, and 4 would be graded as below medium.

It is to be borne in mind that plots 1 and 3 returned a good profit in hay before the wheat was sown. The latter plot, furthermore, repaid an outlay of less than $10 per acre for manure, by an increase of 13.88 bushels of wheat per acre over the yield of the unmanured fallow, and, taking in view the whole period of experiment, stood highest of all the plots in total value of product. Calculating the money-value of the hay at $15 per acre, the value of the products of plot 3 exceeded the values returned by plots 5, 6, and 7 by $15.59, $12.08, and $9.57, respectively. The fallowed plots were much freer from weeds after the wheat-harvest than the two plots on which Hungarian grass had been sown.

HOME-MADE FERTILIZERS.—Mr. Augustus Whitman, of Fitchburgh, Massachusetts, states that in 1872 he prepared four acres of old pasture-land for corn, applying three cords of barn cellar manure per acre, and putting in each hill a handful of a compound of finely ground bone and wood-ashes, mixed according to the recipe of Dr. J. R. Nichols, the well-known chemist, namely: To 1 barrel of pure bone-dust add 2 barrels of wood-ashes, (or, if ashes are scarce, 1 barrel;) mix on a floor with a hoe, adding about 4 bucketfuls of water from time to time while mixing; add ½ bushel of plaster, mixing well to prevent loss of free ammonia; let the mixture lie one week before using. Mr. Whitman obtained 101 bushels of shelled corn per acre. This was the measurement after drying the product in a warm room till January 24, 1873, and then weighing carefully.

BUSH GROWTH PLOWED IN.—A farmer states an experiment with one acre of poor land, one-half of which was covered thickly with water-bush, hard-hack, and other small bushes. This growth was cut, drawn into piles, and exposed to the weather for one year, and then plowed in. The other one-half acre was dressed with two cords of barn-yard manure. The latter piece did rather the best for the first year, and did well for five years, but for the following ten years the bush ground did the best. This more lasting fertility is attributed by the experimenter to the decomposition of the vegetable material plowed in, and the decay of the rootlets of the bushes.

CLEANED AND UNCLEANED SEED.—Professor W. W. Daniells, of the University of Wisconsin, reports that, repeating an experiment made in 1871, he sowed, May 24, 1872, two adjacent plots, each of 112 square rods, with Surprise oats, 54 quarts to each plot. The seed on one plot had been well cleaned from chaff and light grain, and the seed on the other plot was sown as taken from the bin; weight of the cleaned seed, 66¾ pounds, and of the uncleaned, 62½. The following table summarizes the results for the two years:

Preparation of seed.	Weight of seed per bushel, pounds.		Weight of product per bushel, pounds.		Yield per acre, bushels.	
	1871.	1872.	1871.	1872.	1871.	1872.
Cleaned	30.00	39.50	35.50	25.00	48.25	17.50
Uncleaned	27.25	37.00	33.50	25.00	43.75	15.30

In explanation of the small yield of 1872 Professor Daniells remarks that the fall of 1871 was unusually dry, there being only twelve days of rain or snow fall from September 1 to November 30, and this prevented the usual amount of fall plowing. The winter was steadily cold and dry. The spring was late and cold, and consequently the spring sowing of grain was late; the soil, furthermore, was in poor condition to withstand the drought, which, commencing soon after planting, was especially severe in that section and continued till September 22.

FERTILIZERS ON SUGAR-BEETS.—The following is an abstract of a report of Professor C. A. Goessman, of the Massachusetts Agricultural College, on experiments illustrating the effects of different fertilizers on the quality of sugar-beets: A piece of land was set apart on the college farm 287 feet long and 157 feet wide, the soil a brown, sandy loam which had been well manured during the two preceding seasons. Division was made into six plots of equal size, extending across the field from east to west, spaces of two to three feet in width being left between adjoining plots, and several varieties of sugar-beet were planted in rows extending north and south through all the plots. Plot 1 was not fertilized. Plot 2 received crude Stassfurt potassium sulphate, containing 54 per cent. of potassium sulphate, or 29.3 per cent. of potassium oxide. Rate of application, 300 pounds per acre. Plot 3 received per acre 300 pounds of kainit, containing 28 per cent. of potassium sulphate, and 300 pounds of superphosphate from bone-meal, containing 10 to 11 per cent. of soluble phosphoric acid. Plot 4 received per acre 1,200 pounds of blood-guano containing potash. Plot 5 received per acre 1,200 pounds of blood-guano without potash. Plot 6 was manured May 7, 1873, with fresh horse-manure, at the rate of 14 tons per acre. Planting took place May 16, 1873. Varieties planted, Vilmorin and Electoral, raised in 1872 on the college farm, a white sugar-beet received from Freeport, Illinois, and Sutton's improved English beet, obtained from Albany, New York. The crop looked well throughout the season. The examination of the roots was carried on for two weeks, commencing October 6, and roots corresponding in size were selected for test, varying in weight from 12 ounces to 2 pounds each. The table gives the percentage of cane sugar found in the juice of the several varieties of beet which had been treated with the named fertilizers:

Plots.	Fertilizers.	Varieties of sugar-beet.			
		Freeport.	Sutton's.	Electoral.	Vilmorin.
1	No manure; second year after stable-manure	13.49	....	12.78	12.19
2	Sulphate of potassa	14.52	12.42	14.32	12.78
3	Kainit and superphosphate	13.15	10.91	12.16	10.50
4	Blood-guano with potash	12.55	10.01	13.24	10.50
5	Blood-guano without potash	10.99	9.17	10.10	10.20
6	Fresh horse-manure	11.96	9.71	9.42	7.80

Some of these results have been confirmed by repeated trials. Attention is specially called to the injurious effect of fresh stable-manure in the first year, (plot 6,) even on a light sandy loam.

Experiments in 1872.—Professor Goessman remarks that the manufacture of sugar from the beet-root depends not merely on the percentage of sugar, but also on the relative proportion of cane-sugar and of foreign substances contained in the juice of the sugar-beet, and in illustration of the effects of different methods of manuring on this proposition he gives the results of experiments made in 1872 on the college farm and in various localities in New York. In all these trials the same description of seed was used, namely, seed imported from Saxony. The

following is a statement of localities of production and leading characteristics of soils, also methods of fertilization:

1. College farm. The soil a sandy loam, which had been well manured in the spring with stable-manure. The seed was planted May 23, 1872; samples of the crop were collected at the close of September. Six roots, varying in weight from one pound to two pounds, furnished a juice measuring 11.75 degrees of Brix's saccharometer at 50° F. and containing 7.37 per cent. of cane-sugar in solution according to a test by the polarization apparatus of Dubosq-Soleil.

2. A farm at Sing Sing, N. Y. The soil a loam, 2 feet deep, resting on a clayish hard-pan 5 to 6 feet thick; the land had been in grass for a course of years, and tomatoes had preceded the crop of sugar-beets. Five hundred pounds of a phosphate blood-guano were applied before planting the beet-seed. Samples of roots were taken in the latter part of October, weighing one pound to two pounds each.

3. A farm in Washington, Dutchess County, N. Y. The soil, a clayish loam, had been plowed 7 inches deep. A liberal amount of sheep-manure was placed in trenches, and these were covered by throwing two furrows together into a ridge. The seed was planted on the ridge May 18, and the crop was harvested in November. Samples were selected weighing one pound to two pounds each.

4. A farm at South Hartford, N. Y. The soil a gravelly loam richly manured with stable-compost, and plowed twice before planting the beet-seed. Roots weighing one pound to two pounds each were selected at harvest.

5. The soil a sandy loam underlaid by pure sand. The seed was planted in ridges over trenches containing a small amount of stable-manure. The roots were gathered in November, and samples were selected weighing one pound to two and one-half pounds each.

6. A farm at Frankfort, N. Y. At harvest roots were selected weighing one pound and six ounces to four and one-half pounds each.

7. A farm at Albion, N. Y. The soil a dark reddish brown, rich, deep, sandy loam. The previous crops had been clover for two years, followed by carrots. The sugar-beet was planted May 8, constituting the second crop after an application of horse-manure. The roots were harvested November 13. Six samples were tested, three weighing ten to fourteen pounds each, and three one and one-half pound to two pounds each, this comparison of sizes being made for the purpose of illustrating the difference in value of large and small roots for production of sugar. The following table represents the percentages of cane-sugar and of foreign substances contained in the juice of the beets, and also the relative proportion of foreign substances to the amount of cane-sugar:

Localities of beet-fields.	Saccharometer of Brix.	Percentage of cane-sugar.	Percentage of foreign substances in solution.	Proportion of foreign substances to 100 parts of cane-sugar.
1. College farm	11.75°	7.37	3.38	45.86
2. Sing Sing, N. Y	11.00°	7.80	3.20	41.02
3. Washington, N. Y	14.00°	10.97	3.03	27.62
4. South Hartford, N. Y	15.00°	11.70	3.30	28.20
5. Greenwich, N. Y	12.00°	9.50	2.50	26.31
6. Frankfort, N. Y	13.50°	11.00	2.50	22.72
7. Albion, N. Y., small roots	18.00°	15.10	2.90	19.20
7. Albion, N. Y., large roots	14.00°	9.70	4.30	45.26

Professor Goessman says: "The larger the percentage of foreign substances contained in the juice the greater, as a general rule, are the ex-

penses of their separation, and thus of the manufacture of the cane-sugar. A good root of the sugar-beet ought to contain in solution not more than from eighteen to twenty parts of foreign substances for every one hundred parts of cane-sugar." Having this statement of proportion in view, it would appear that the only satisfactory result shown is in the case of the small roots from Albion, N. Y., and Professor Goessman concludes that an improper application of fertilizers was the cause of failure in the other cases; for example, "the application of highly nitrogenous fertilizers, or the incorporation of partly decayed organic substances, like stable-manure, in the soil during the spring which directly precedes the cultivation of the sugar-beet."

EXPERIMENTS ON SWEDES.—The following is a presentation of leading points in a report offered by Professor Wrightson at a recent meeting of the Cirencester Chamber of Agriculture, England. The report refers to experiments made with various commercial fertilizers on swedes, in 1873, in continuation of trials in former years under the general direction of that organization. The experiments of 1873 took place on twelve different farms, including that of the Royal Agricultural College, and in all the cases the fertilizers were applied according to a carefully concerted system, being drilled in with the seed by means of a liquid-manure drill constructed for the purpose. The tabulations here given are for seven of the farms, and cover chief points of variation. The experimental plots were each one-twentieth of an acre, and on each farm two plots were allotted to each description of fertilizer. The table shows the amounts of swedes, per acre, consequent on the respective applications.

Fertilizers, per acre.	DESIGNATIONS OF FARMS.																				
	Earl Bathurst.			R. A. College.			Mr. J. Smith.			Rev. T. Maurice.			Mr. Price.			Mr. Iles.			Mr. W. J. Edmonds.		
	T.	*cwt.*	*lbs.*	*T.*	*cwt.*	*lbs.*	*T.*	*cwt.*	*lbs.*	*T.*	*cwt.*	*lbs.*	*T.*	*cwt.*	*lbs.*	*T.*	*cwt.*	*lbs.*	*T.*	*cwt.*	*lbs.*
1. 3 cwt. Peruvian guano.	20	18	104	14	12	16	13	17	56	7	15	20	9	18	64	10	8	4	15	1	108
	20	19	72	15	16	28	15	17	96	6	0	0	9	14	32	13	8	4	15	12	76
Average	20	19	32	15	4	22	14	17	76	6	17	66	9	16	48	11	18	4	15	7	36
2. 3 cwt. 60 pounds dissolved	20	15	60	16	0	0	15	0	0	9	10	60	14	11	48	10	2	36	15	18	84
Peruvian guano,	21	3	84	17	14	52	17	9	13	8	11	8	8	15	40	11	2	76	15	6	88
Average	20	10	72	16	17	26	16	4	63	9	0	90	11	13	44	10	12	56	15	12	86
3. 3 cwt. mineral superphosphate.	18	11	8	13	6	63	17	10	100	14	16	8	12	9	12	13	15	20	12	16	108
	18	0	80	15	3	84	15	18	84	17	10	0	10	17	36	13	13	44	11	3	64
Average	18	5	100	14	5	20	16	14	92	15	18	4	11	13	24	13	14	32	12	0	30
4. 3 cwt. min'l superphosph.,	20	6	8	18	1	48	17	18	64	14	9	32	13	5	100	13	3	64	16	1	48
3 cwt. Peruv. guano.	21	11	48	19	5	60	18	13	44	14	0	0	13	12	96	14	10	60	17	13	4
Average	20	18	84	18	13	54	18	5	108	14	4	72	13	9	42	13	17	6	16	17	26
5. 3 cwt. min'l superphosph.	19	2	16	13	10	80	15	12	76	15	15	60	8	9	62	12	18	4	12	6	48
½ cwt. organic matter.	19	16	108	14	15	60	17	1	8	14	11	68	11	15	100	14	6	28	13	6	48
Average	19	9	62	14	3	14	16	6	98	15	3	64	10	2	81	13	12	16	12	16	48
6. 3 cwt. min'l superphosph.,	20	17	76	14	7	36	17	9	92	15	10	20	12	1	6	16	0	60	14	4	72
added to fertilizer 7.	19	14	72	16	6	58	15	2	36	16	4	12	11	3	84	16	8	84	11	11	82
Average	20	6	18	15	6	61	16	6	8	15	17	16	11	12	45	16	4	72	12	18	16
7. ½ cwt. organic matter, ½ cwt. nitrate soda, 1	15	5	40	11	12	36	16	6	68	1	0	0	9	11	68	7	16	108	5	7	36
cwt. potash salts.	13	8	104	13	12	76	16	5	60	2	11	48	10	2	56	7	7	16	6	10	100
Average	14	7	16	12	12	14	16	6	8	1	5	80	9	17	6	7	12	6	5	19	12
8. Unmanured.	12	5	20	10	9	72	14	13	44	1	17	76	9	8	44	6	5	0	3	15	100
	11	15	60	9	12	76	15	12	96	1	3	84	8	13	4	5	1	36	4	4	72
Average	12	0	4	10	1	18	15	3	14	1	10	80	9	0	75	5	16	18	4	0	30

The following shows the averages of increase of crops per acre resulting from the various applications; also the number of plants per acre, averaging the plots in each case. Figures of yield having the minus sign prefixed exhibit the decrease from yield on unmanured land.

Fertilizers.	Designations of farms.						
	Earl Bathurst.	R. A. College.	Mr. J. Smith.	Rev. T. Maurice.	Mr. Price.	Mr. Iles.	W. J. Edmonds.
	Tons cwt. lbs.	*Tons cwt. lbs.*	*Tons cwt. lbs.*	*Tons cwt. lbs.*	*Tons cwt. lbs.*	*Tons cwt. lbs.*	*Tons cwt. lbs.*
1	8 19 28 (13,540 plants)	5 3 4 (11,360 plants)	—0 5 50 (8,600 plants)	5 6 98 (5,480 plants)	0 15 85 (8,100 plants)	6 1 98 (12,100 plants)	11 7 6 (13,180 pl'nts)
2	8 19 68 (13,360 plants)	6 16 8 (11,740 plants)	1 1 49 (9,300 plants)	8 10 10 (5,600 plants)	2 12 81 (10,380 plants)	4 16 33 (10,760 plants)	11 12 56 (14,380 pl'nts)
3	6 5 96 (13,480 plants)	4 4 2 (15,620 plants)	1 11 79 (15,980 plants)	14 7 36 (18,100 plants)	2 12 61 (17,300 plants)	7 18 14 (18,540 plants)	8 0 0 (14,280 pl'nts)
4	8 18 80 (13,420 plants)	8 12 36 (13,620 plants)	3 2 94 (13,320 plants)	12 13 104 (11,200 plants)	4 8 79 (13,060 plants)	8 0 100 (14,360 plants)	12 16 108 (14,360 pl'nts)
5	7 9 58 (14,500 plants)	4 1 108 (15,300 plants)	1 3 84 (15,500 plants)	13 12 96 (17,420 plants)	1 1 6 (17,420 plants)	7 15 10 (18,240 plants)	8 16 18 (14,840 pl'nts)
6	8 6 14 (13,440 plants)	5 5 43 (15,660 plants)	1 2 106 (14,280 plants)	14 6 46 (17,400 plants)	2 11 82 (17,180 plants)	10 8 54 (18,340 plants)	8 17 98 (14,440 pl'nts)
7	2 7 12 (14,100 plants)	2 10 108 (14,960 plants)	1 2 106 (14,740 plants)	—0 5 0 (12,360 plants)	0 16 43 (16,580 plants)	1 15 100 (17,180 plants)	1 18 94 (14,760 pl'nts)
8	.... (13,960 plants)	.... (15,320 plants)	.... (16,560 plants)	.... (11,420 plants)	.... (17,860 plants)	.... (16,000 plants)	.... (14,460 pl'nts)

A few discrepancies of figures are observable in the tables as received, but they are not of moment.

Guano and superphosphate.—Throughout the seven farms, generally speaking, the largest returns in increase of yield were obtained from fertilizer 4, guano and superphosphate. Guano applied alone gave a large increase, but its effect was much injured on several of the farms by the destruction of seed coming in contact with this powerful stimulant. This tendency to injury was diminished when the guano was mixed with superphosphate, which is supposed to have partially sulphated the guano.

Size of roots.—The following notes of average weight of roots on certain plots will be found worthy of attention in connection with the tabular exhibits: On the farm of Earl Bathurst, plots 4, dressed with guano and superphosphate, returned 3.5 pounds as the average weight of roots, slightly more than the average of plots 1 and 2; average weight on unmanured land, 1.7 pound. On the farm of Mr. J. Smith, plots 1 and 2, dressed with guano, averaged in weight of roots 3.94 pounds, against 3.14 pounds on plots 4 and 2.13 pounds on unmanured soil. On the farm of Rev. T. Maurice, the unmanured plots returned only .32 pound as the average weight of roots; average weight on plots 2 and 1, 3.63 pounds and 2.64 pounds, respectively.

The different soils.—In respect to the character of the different fields, Mr. Wrightson reports that the land of Earl Bathurst was free-working, of fair quality, and, from the account of previous treatment, presumably in fine condition. The soil of the Royal Agricultural farm was rather thin, of fair quality, and in fair condition. The field of Mr. J. Smith was naturally very rich, and in such excellent condition that the unmanured plots yielded a large crop. Consequently, the fertilizing applications produced but a small increase. The yield of the unmanured plots on the Maurice farm points to a low degree of fertility, and on this farm the fertilizers had a very marked effect, while the destructive action of guano in contact with seed was plainly shown. On another farm, not exhibited in the tables here given, that of Mr. Edward Bowly, where the

land was in good condition, the crop on plots 1, dressed with guano, fell below the yield of unmanured soil. The land of Mr. Price was thin and stony, and in ordinary condition. One portion of the field, not represented in these abridged tabulations, was dressed in January, 1873, with farm-yard manure. On this previously manured portion little advantage was gained by the applications of artificial fertilizers, and several of these applications, especially those of guano, plots 1 and 2, resulted in diminution of product. Mr. Wrightson suggests the use on this estate of farm-yard manure for wheat, and artificial manures for turnips and other roots. The field of Mr. Iles had a black soil of medium quality, and was in fine condition. In this case there is noticeable a very favorable effect from mineral superphosphate alone, almost equal to that on plots 4, dressed with superphosphate and guano. But a very marked superiority is exhibited on plots 6, exceptional as compared with the exhibits of corresponding plots on most of the farms. On the land of Mr. Edmonds, a stony clay of poor character, guano exhibited a large increase of crop. Guano and superphosphate gave a still greater yield, but the extra increase was not in proportion to the additional expense of application.

Methods of applying guano.—In remarks following Mr. Wrightson's report, Mr. Iles said that his own plan of applying guano was as follows: He drilled the seed with superphosphate, using 2 cwt. of the latter per acre, and when he had singled out the plants he top-dressed with 2 cwt. of guano per acre, horse-hoed, in order to throw the guano up to the plants, and gave the field no further treatment for the season. He generally got a good crop of swedes, without loss of plants.

Mr. Anderson said that, as far as his experience and information extended, while guano produced heavier roots than superposphate, the quality of the product from the former application was not as good as that from the latter.

RECENT RURAL PUBLICATIONS.

Bulbs: A Treatise on Hardy and Tender Bulbs and Tubers. By Edward Sprague Rand, jr. Small quarto, 350 pp. Boston: Shepard & Gill. 1873.

This is a new and enlarged edition of an interesting work issued by Mr. Rand in the year 1866. In its enlarged form only a limited number of copies of the work have been issued. It is well bound and beautifully illustrated with colored plates. It is the only work from the pen of an American author, exclusively devoted to the cultivation and treatment of bulbous and tuberous plants. The various species and varieties are treated separately, the author giving full directions for their cultivation and rules for their proper treatment when attacked by disease or injurious insects. As the plants of which this volume treats are among the most beautiful in the floral kingdom, the general rules laid down for their culture will no doubt prove interesting and valuable to the novice in flori-culture.

The author says that the primary rule in bulb-culture is, grow the foliage well. The stronger and more vigorous the leaves are, the stronger will be the bulb, and, consequently, the larger and finer the bloom. Neglect of this rule is the cause of most failures. To bloom the bulb well the first year is easy; but if, the second year, you can produce as fine, or even finer flowers, you can claim to possess skill in bulb-culture.

Holland is the great bulb center. Here this business has been carried

on so extensively for many years past, that certain exotic bulbs, such as the tulip, hyacinth, and crocus, are generally known as "Dutch, or Holland bulbs." Imported bulbs are often weak from being kept a long time out of the ground; this is especially the case with lilies and erythroniums, of which a large proportion never survive the first winter; the crocus and hyacinth, being of a different nature, are seldom injured. The bulbs should be planted at once in proper soil; if out of doors, in a well-drained bed; if in doors, in well-drained pots. Hardy bulbs may be planted as late as the ground keeps open. As a general rule, however, the bulbs should be planted in October, in order that the roots may make a good growth before the cold weather sets in. The mode of planting must vary according to various tastes; but generally the bulbs should be so grouped as to give the best effect when in blossom. Each kind should be planted in masses by itself, if the full effect of each be desired. The hyacinth and narcissus do not accord well together, nor do jonquils and fritillarias. The smaller bulbs should be planted in the foreground, the taller growers behind; thus each, when in bloom, appears to the best advantage. Clumps of white, blue, yellow, and purple crocus, planted alternately with broad belts of snow-drops, are very showy. In planting in the ground, the general rule is that the crown of the bulb should be placed an inch below the surface; if in a situation, however, where the bulbs would be liable to be thrown out by the frost, an inch and a half will not be too deep. The larger the bulb the deeper it should be planted. All lilies and crown-imperials should be set three inches below the surface, and even deeper if the bulbs are very large. The crocus should be set deeper than bulbs of the same size, as its tendency is to grow out of the ground; and the iris rather higher, as it naturally buries itself; this on the supposition that the bulbs are not to be taken up annually. The bulb-bed may be made more effective if gently sloped from the back to the front. There is often a difference of three weeks in the blooming of bulbs planted at the same time under a south and west window, the difference being in favor of the former. The bulbs having been planted, as soon as the ground begins to freeze at night the bed should be covered with three or four inches of coarse litter, which will prevent the earth from freezing very deep, and thus allow the roots to grow all winter. As soon as the flowers have faded, all seed-vessels should be removed, unless it is desirable to raise seedlings. The ripening of seed weakens the bulb. If the spring is very dry, the bed should be occasionally watered to prevent the premature ripening of the foliage and to encourage its growth. As soon as the leaves have faded they should be removed; and the bulbs should rest (if not taken up) until they naturally begin to grow again. As soon as frost appears, the bed should be cleared, carefully forked, (except where the bulbs are,) and a coating of fine manure supplied. It is a good plan to supply weak liquid manure, and an addition of powdered charcoal to the soil of the bed will give additional brilliancy to the flowers. Powdered bone or horn-scrapings are also excellent manures.

The culture of tender bulbs is similar to that of the hardy species. Potted in well-drained pots, they should be gently watered and kept in a warm, shady place till they begin to grow; then water should be more freely given, and they should be placed in full sunlight, and as near the glass as possible, to encourage a thick, sturdy growth. When in bloom, they should be kept cool, that the duration of the flower may be prolonged. During growth, copious syringing should be given, to destroy the red spider, the great enemy of green-house bulbs. They should not

be allowed to ripen seed. After blooming, the leaves should be grown until the tips begin to turn yellow, when water should be less frequently administered, and the plants be gradually dried off. When thus at rest, the pots should be turned on their sides, placed on shelves, or in a shed or cellar, and so remain until the season for repotting. Bulbs with evergreen foliage should never be entirely dried off; but the supply of water should be greatly reduced until the plants again show signs of growth.

On the subject of growing bulbs for the parlor, Mr. Rand says:

Growing bulbs in water seldom gives very fine flowers, but its simplicity and pretty effect will always recommend it. The bulbs should be placed in the glass in November; the glass being filled with rain-water up to the neck, so that the base of the bulb may just touch it. Place the glasses in a warm, dark place, keeping them filled with water for three weeks, or until the glass is half filled with roots, then remove to the light, and gradually to full sunlight. After blooming, if it is desirable to preserve the bulb, it should be taken from the glass and planted in earth to strengthen it.

The water in the glasses should be changed every week, or as often as it becomes cloudy, (a bit of charcoal in the water will, however, keep it sweet and clear,) and, in renewing the water, care must be taken that that supplied be of the same temperature as that taken away. Dark-colored bottles are the best for growing bulbs in this way. Bulbs usually grown in glasses are hyacinths, but we occasionally see English iris, tulips, and narcissus, which make a pretty show, the treatment required for them being the same as for the hyacinth. A few drops of glue or ammonia, added to the water in which the bulbs are grown, increases the brilliancy of the flower and strengthens the bulb.

Hyacinths are sometimes grown in a carrot or turnip, hollowed out and filled with water. The bulb grows well, and a growth of young foliage springs from the top of this novel flower-case and entirely conceals the bulb. The treatment is the same required by bulbs in glasses.

Pots or glasses may be filled with moss and bulbs grow very prettily therein. The treatment is the same as that required by bulbs in earth. A very pretty way is to make a ball of moss, fill it with bulbs, wire it round, and hang it in a warm, light place, occasionally turn it to make an even growth, and dip it in water when it gets dry. The shoots of the bulb will cover the moss and the roots will run through the inside. The Jacobean lily (*Sprekelia* or *Amaryllis formosissimus*) grows in this way, and is a fine summer ornament.

Growing bulbs in sand is a popular mode, as sand is cleaner than earth, and the contrast of the white sand and green leaves is very pleasing. The only care necessary is to see that the sand contains no salt, and that it never becomes dry.

The Perfect Horse: How to know him; how to breed him; how to train him; how to shoe him; how to drive him. By William H. H. Murray. With an introduction by Rev. Henry Ward Beecher; and a treatise on Agriculture and the Horse, by Hon. George B. Loring. Containing illustrations of the best trotting stock-horses in the United States, done from life, with their pedigrees, records, and full descriptions. Boston: James R. Osgood & Co. 8vo, 480 pages. 1873.

The author, a well-known clergyman of Massachusetts, announces it as the especial object of his book to put into a small compass and cheap form the result of many years of reading and observation, that every farmer's boy in New England may have in his possession a book which shall contain enough of instruction to qualify him to breed, train and drive, buy and sell horses intelligently and profitably. He desires to convey lessons in sound principles of breeding fleet and valuable horses, not leaving the propagating of such to mere chance or "blind luck," as it is called. Men often enter upon the rearing of fine horses, as a business, without any practical or even enlightened theoretical knowledge of the subject, as derivable from close study of authorities; and "people can be found all over New England and the country who will question the profitableness of breeding fine horses on the ground that many of those who have attempted it have not been successful;" failing, however, to see that lack of acquaintance with the principles and demands of the pursuit is the prime cause of failure. Mr. Murray is convinced that the breeding of superior horses will yield, for the money invested,

a larger return by 20 per cent. than any other branch of agriculture, especial reference being had to New England. He says, (page 78:)

The fact is, agriculture proper—by which I mean the tillage of the soil and the production of those products that grow directly out of the soil—can no longer be relied upon to keep alive the agricultural spirit, or sustain the agricultural wealth of New England. We cannot compete successfully with the Middle States and the great West in the raising of cereals, or, indeed, in the breeding of those animals whose market value can never rise beyond a certain moderate price, and to fit which for the market the products of their great wheat and corn fields are serviceable. Hence it comes about that in swine and beeves, and the lower-price horses, New England can never compete with Ohio and Illinois, Wisconsin and Texas. When horses of good serviceable quality for family and team use can be shipped from Michigan to Boston, and sold in our stables at a hundred and seventy-five dollars per head, no Massachusetts breeder can afford to raise colts of ordinary quality. So long as the cost of transporting a horse from the West to the seaboard is less than the difference of the cost of supporting him from the time he is foaled to the time he is ready for market, New England cannot afford to breed low-priced animals. It is, therefore, only in raising such animals as are of fine quality that we of the Eastern States can find our reward. * * * * While I maintain that breeding can be made in New England to yield a liberal return for the money invested, it cannot be made to do this save when it is conducted with knowledge and understanding of those principles which insure success. In brief, it is like any other business; it can be conducted successfully only by those who understand it.

Of the great importance to even a State of paying scrupulous regard to a distinguished stock-family, Mr. Murray is firmly convinced. The Morgan horse, in favor of which he is very much prepossessed, originated in Vermont with a stallion named Justin Morgan. His extraordinary reproductive faculty was transmitted to his sons, claimed to be the highest form of all excellence in a stock-horse, and every succeeding foal, without regard to blood intermixture, even of strong types, was distinctively a Morgan. "Nor," says the author, "did this power die out in one or two generations, but continued on like a stream having a constant source; and might have been prolonged, doubtless, unto this day, had not the State which had been enriched and made famous by this animal and his descendants committed financial suicide by allowing the family to be scattered, and the family type itself bought away from it. Not alone Vermont, but the entire country were losers when the Morgan family ceased to have a 'local habitation,' although it could never cease to have 'a name.'"

There is no more important part of the work than the chapters relating to breeding, and the absolute necessity on the part of breeders of acquiring accurate knowledge of the principles and laws underlying it. The rule which men follow in regard to the propagating and rearing of other representatives of the animal kingdom, they seem to reverse when they touch the horse. For example, if a man wishes to enter upon the hazards of fish-culture, he invests no money until he has thoroughly investigated the principles which control success—he acquires first a knowledge of all that relates to the fish which may be attainable. The same is, or ought to be, true of the culture of bees, the raising of sheep, of swine, of cattle, &c. But men generally breed horses, "not along the line of certain well-ascertained principles or clearly discovered similitudes, but haphazard, as chance furnishes the opportunity, trusting to luck."

Considering the indispensability of the horse to man as a helper in the labors of the field, in the wants of trade, and in the affairs of every day; regarding the splendid animal, when of blooded lineage, as a "thing of beauty," a delight to the eye, and a satisfaction to the understanding, the sentiment must be participated in, that "it is folly to breed inferior stock. Nothing is to be made from it, as mountains of testimony prove. 'The best or none' should be the motto of the

eastern breeder"—and of the breeder in every other part of the country, it may be added.

Mr. Murray has endeavored, with considerable minuteness as to "points," to describe what he conceives to be the standard horse for the purchaser, or the marks by which a good horse may be known; and the standard horse for breeding, or the perfect stock-horse. His chapters on the proper training of colts and the treatment of the horse's foot are interesting as well as profitable reading, if viewed from a physiological stand-point merely.

Touching the treatment of the foot—and a horse without sound feet is no horse at all, as far as any service is concerned—we cannot forbear to repeat Mr. Murray's rather warmly worded protest:

> One of the greatest obstacles in the way of reformation—for nearly all admit that our system of caring for and shoeing the horse's foot is simply atrocious—is to be found in the ignorance of the average smith. I would not speak disrespectfully of any man or class of men who earn their living by the sweat of their brow, for their industry commends them to courteous mention; but it is a fact that the average horse-shoer of the country is distinguished chiefly by what he does not know, rather than by what he does understand, of the principles and uses of his craft. The only excuse that can be urged in his favor—and to any candid and thoughtful person it will, I doubt not, seem ample—is this: No one has ever taught him anything. There has been literally no avenue of knowledge open to him. In ancient times, veterinary surgeons were the smiths; and by them gentlemen were taught how to shoe their own horses. * * * The education of no knight was regarded adequate for a martial career until he was thoroughly instructed in the principles and practice of farriery. It was not beneath the pride of a noble to desire to excel in protecting the feet of his gallant steed; and no one, either noble or base-born, could presume to touch a foot to fit a shoe to it unless he had been regularly and fully instructed in the art of farriery, any more than a physician could now be admitted to practice, or a lawyer to plead, unless they had gone through the necessary medical or legal study. * * * If the smiths are ignorant, the owners of horses, for the most part, are even more so. * * * Between the two, one can imagine how the poor horse must fare.

After Mr. Loring's article on agriculture and the horse, the volume closes with a "Gallery of Celebrated Horses," comprising a list of the truly *great* stock-horses, according to the author's understanding of what constitutes greatness in horses kept for breeding purposes.

The book has been in some quarters criticised with severity on account of novelties of view on certain related subjects, and there has been dissent from deductions and recommendations of the author; but with these, in calling attention to the work as an addition to the literature of the horse, the Department, of course, has nothing to do.

AN ESSAY ON THE BEST PRACTICAL MEANS OF PRESERVING AND RESTORING THE FORESTS OF OHIO. By Dan. Millikin, Hamilton, Ohio. Columbus: Nevins & Myers' pamphlet. 1872.

Mr. Millikin treats consecutively of the neglect of foresting in Ohio, the fact that wood is indispensable, and the consequent necessity of immediate attention to the subject of timber cultivation as an industry; the impossible substitution of other material for wood; the influence of forests on local climate; the misplacement of Ohio timber, &c. Under the latter head the writer makes complaint that there are too many acres and too few trees; in some counties there are vast tracts of woods, scarcely broken by farm, and these forests must be cleared as the first step in populating and improving the districts. There is need of a comprehensive redistribution over most farms, whereby the best tillable land should be cleared, and slopes and water-courses planted with real forest. Reference is made to the new and enormous consumption of wood by railroads. The aggregate length of wooden railroad bridges in the State of Ohio is nearly sixteen miles, and of trestles more than ten miles. Being perishable structures they must frequently

be replaced; the average age of the seven hundred and seventy wooden bridges in Ohio is only five and a half years, and of the trestles seven years. By a law now in force railroads must be inclosed, which requires more than ten thousand miles of fencing—perishable, as well understood. These roads have more than ten millions of ties, which, lying exposed to air and dampness, decay in six or seven years. Ohio locomotives burned in 1870 eighteen times as much coal as in 1858, but in the same interval the consumption of wood rose from 209,416 cords to 700,000 cords. Speaking of young cultivated timber, Mr. Millikin is convinced that all good artificial timber will find an eager market at an early age by the fact that the country is already stripped of young trees, which have grown rapidly, through accident. The demand for wood for the telegraph system is referred to with emphasis, and the fact mentioned that the so-called cedar poles of the dimension 25 to 28 feet long, and having the diameter at one end of 10 to 12 inches and about 5 inches at the other, are worth 90 cents each in Chicago.

The importance of each farm, fit for the purpose, growing its own lumber, with relation to future need, is very strongly urged. "If nothing else is done, every farm ought to have at least an acre of black-locust trees. No wood is at once so hard, heavy, durable, strong, and easy to grow; it is able to yield a fine return, even without cultivation."

The pamphlet of Mr. Millikin is well worth the attention of students in forestry, as well as the practical agriculturist.

DICTIONARY OF ELEVATIONS AND CLIMATIC REGISTER OF THE UNITED STATES; containing, in addition to elevations, the latitude, mean annual temperature, and the total annual rain-fall of many localities; with a brief introduction on the orographic and other physical peculiarities of North America. By J. M. Toner, M. D. New York: D. Van Nostrand, publisher. 1874, 8vo., 93 pp.

The particulars embraced in the dictionary are set out with sufficient clearness in the title. The arrangement of the dictionary is admirable, and its mechanical method uninvolved—a book small in compass and easy of reference. In addition, a table has been arranged which shows the geographic position and elevation in feet above the sea-level of the chief capital cities of the world. The practical purposes of the dictionary, hygienic, agricultural, &c., are given with clearness in the introduction, which, while terse, embraces all material facts bearing upon the importance of considering, with reference to certain subjects, the matter of elevations and barometrical and thermometrical ranges.

In connection with the physical peculiarities of the United States, the writer takes a brief backward glance to observe where it has been the disposition of the human family to locate its residence in different epochs. The conclusion is arrived at that in the lowlands, not the highlands, of the world the seats of population and power have nearly always been found, the cause residing in the fact that proximity to an abundance of water was of prime necessity for carrying on commerce and manufacturing. Agriculture builds no large cities; "and while it is essential to empire and permanent national greatness, as the foundation of all independence and substantial power, it does not immediately supply that intimate aggregation and association of individuals on which the structure of ordinary power and dominion is usually reared.'

The seemingly paradoxical statement is made that the preservation of health and the culture of physical energy have ever been a secondary and subordinate consideration to man, and he rarely selects his home, in the first instance, with any special reference to salubrity and climatic influence, but, rather, cupidity and love of pleasure have been the potent

inducements which have led him into braving dangers, while bearing immediate physical discomforts—"and have been more powerful than the apprehension of death or the considerations conducive to the preservation of health." The writer further says:

The impression is almost universal that a residence in a moderately elevated region, either in the tropical or temperate zone, anywhere between a few hundred feet above the level of the sea and a line that marks Alpine vegetation, is healthier than the tide-water lands. It is in this intermediate strata of climatic and barometric influence that the human race attains its noblest physical development. Here the lands produce in the greatest abundance the essentials for the support of animal life, &c.

In the United States the great proportion of the population is in States with an average elevation under 1,100 feet above sea-level.

The author announces it as the purpose of his work to furnish exact data, and, as far as practicable, to call attention to the influence of altitude upon the natural productions and the cultivable crops and fruits, and upon human health, and, on this account, obtrudes no theories of his own. From an agricultural point of view, he thinks that a knowledge of the extremes of the range of the thermometer is more important than the average or mean, and that some of our most valuable crops, being annuals, care but little for the extreme of cold in winter, providing they have the required amount and duration of heat in summer for ripening; and in any region, where the summer heats rise high enough for about four months, valuable spring crops of wheat, corn, oats, and potatoes can be raised. The major supply of the principal grains necessary for the sustenance of man and animals comes from States occupying a zone that crosses the continent between the thirty-fourth and forty-eighth degrees of latitude, but chiefly east of the ninety-fifth degree of longitude, and at an elevation ranging between 250 and 1,000 feet above the sea. Corn grows at a slightly lower elevation than wheat, and, as the author shows in an appended table, in greater quantity in the more southern States. It is also observed that the most productive States, and consequently those of greatest aggregate wealth, are to be found among those having an average elevation above the sea of from 400 to 1,000 feet. We quote the following remarks, as being of interest:

It has been observed that the greatest aggregate productions of the cereal grains is in the Middle States enjoying a medium average altitude. The semi-tropical features of the Gulf States are particularly exhibited by their staple productions of sugar-cane, cotton, tobacco, corn, rice, &c. But as an equitable and rather high temperature with an abundance of moisture are the chief essentials for these productions, they may, owing to the curvatures of the isothermal lines, be grown in favorable seasons in many localities in the Northern, Middle, and Western States, and even at considerable elevations.

Many interesting facts as to growth of useful products at particular elevations are presented. All the food-plants and cultivable grasses, says Dr. Toner, either possess originally or acquire a capacity to grow under a wide range of climatic variations. Corn and the potato, offspring of the New World, are now cultivated in almost every part of the civilized world, the climatic influences widely differing. The potato is produced in abundance and reaches great perfection on the Andes at an elevation of from 9,000 to 13,000 feet; in Virginia, in the notch between the Peaks of Otter, at an elevation of over 3,000 feet above the sea. On Chimborazo Indian corn and wheat grow at 10,000 feet, barley and the more hardy grasses at 15,000 feet—and above this perpetual frost.

Much attention is given to the treeless, arid plateau known as the American Desert. Dr. Toner seems to coincide in the view that the genius of American people will in time be equal to bringing out the capacities of this region for supporting a considerable population, transforming it to some extent into an agricultural and grazing country. As

to the hygienic feature of these great plains, the observation is made by careful observers who have resided for years on them that they have frequently noticed speedy and marked improvement there in the health of soldiers and officers who had been suffering from bronchial and pulmonary troubles when at posts along the Atlantic coast.

Dr. Toner has incorporated in his introduction several valuable statistical tables carefully collated from the census of 1870, and from other sources, which bear upon the general subject.

The author very gracefully dedicates his work to Prof. Joseph Henry, Secretary of the Smithsonian Institution, "who by his important discoveries in electricity and magnetism, by a life devoted to science, and by constant aid and encouragement to others, in the discovery of new truths and their dissemination among mankind, is entitled to the highest regard of the people of the United States and of men of science throughout the world."

ON THE CULTIVATION AND CURING OF TOBACCO, and more particularly of fine yellow tobacco. By Maj. Robert L. Ragland, of Halifax County, Va. Richmond: Clemmit & Johns. 1872.

A small pamphlet, giving the results of the writer's experience in tobacco-raising, and containing practical suggestions for those already engaged in the culture, as well as for those about to enter upon it. The principal value of the pamphlet is in the advice given relative to the treatment of yellow tobacco, describing the steaming or yellowing process, the fixing of color and curing of the leaf, the stalk, and the stem, respectively. The author thinks that perseverance in following a proper and well-defined method in preparing tobacco of this description would reward the cultivator in the doubling or even trebling of his income from the crop.

COFFEE: ITS HISTORY, CULTIVATION, AND USES. By Robert Hewitt, jr. Illustrated with original designs by eminent American artists, and a map of the world showing the several places where coffee is or may be produced, and where it is also used. New York: D. Appleton & Co. 1872.

An interesting treatise, as gathering up the loose ends of history relating to coffee, as to its origin, introduction among peoples, sanitary relevancy, &c. The book is practical as well as quaint. The statistical tables will be found to contain much of interest. As given by this author, the following is the average composition of raw coffee:

Woody matter	34
Water	12
Fatty matter	13
Gum, sugar, and caffeic acid	18
Caffeine	2
Azotized matter, analogous to legumine	13
Saline matter, essential oils, &c	8
Total	100

It is stated as an interesting fact, and as among the curiosities of chemistry, that a most magnificent purple dye can be prepared from the alkaloid of coffee. It is analagous to the dye which produced the famous Tyrian purple, unsurpassed for its perfection and permanence of tint. Mention is made of the facts that coffee, although a native of the Old World, has long been one of the most important staples of the New. Meyen, in his inquiries concerning the principal plants on which the prosperity of nations is based, says that he even found some coffee-trees growing wild in Brazil, not far from Rio Janeiro, in the woods of Corcorado; that it is the great commercial staple of the empire of Brazil, which is now the greatest coffee-producing country of the globe, Java being the next in order; and, although the latter does not con-

tribute one-half the quantity of the former, yet it furnishes nearly three times as much as other markets.

As showing the estimation in which coffee is held in the United States, the fact is referred to that the annual consumption is greater than anywhere else in the world; to the extent of six-fold larger than in some of the states of Europe. Germany and France stand next to us in the rank of great coffee-drinkers.

PRACTICAL TROUT-CULTURE. By J. H. Slack, M. D., Commissioner of Fisheries, New Jersey; Natural History Editor of "Turf, Field, and Farm," New York; Proprietor of Troutdale Ponds, near Bloomsburg, N. J. New York: George E. Woodward. Orange Judd & Co. 1872.

DOMESTICATED TROUT. How to breed and grow them. By Livingston Stone, A. M. Boston: James R. Osgood & Co. 1872.

The subject of fish-culture is attracting to the ranks of discussion a host of practical workers and thinkers. The multiplication of fish has become a matter of considerable importance with relation to commercial as well as dietetic interests. Whether the trout can be domestically grown is not any longer a question. The discussion of cheap modes is now the order. In the works before us there is intelligent treatment of the subject which gives note of progress in material aspects.

Dr. Slack discusses the particulars pertinent to the choice of fields for operation; the planning and construction of ponds; the arrangement of hatching-houses and apparatus; methods of artificial impregnation, and management of the nursery, including the preparation and method of feeding. He supplies, also, a valuable chapter on transportation, treating of the packing of spawn, dangers to be avoided in transit, &c.

Mr. Stone writes a book of much practical interest, giving us a glance of trout-breeding works and breeding processes. His summary chapter, in two sections, treats specially of the work of a trout-breeding establishment in all seasons; the pecuniary view of trout-growing; current expenses; margins of profit; estimates; risks; sale of young stock; prices current; summary of directions in regard to water, ponds, nursery, eggs, young fry, and large trout.

The author has discovered that salt is a destroyer of microscopic parasites on trout. The views of Mr. Stone on this point are here transcribed at length:

In the spring of 1872 I began some microscopic examinations of the parasites on large and small trout, which led to the discovery of a cure for what has hitherto been thought to be an incurable disorder.

It is well known that when trout become injured or unhealthy a fungoid growth appears in blotches over the surface of their backs, usually terminating in fatal results in a few days.

It has hitherto been supposed, I believe, that the fungus eats into the tissues of the fish and destroys it. The microscope revealed, however, that it was not the fungus that penetrated into the fish but a multitude of microscopic worms. * * * * The worms are never found in the upper parts of the fungus, but just below at the roots, or where the fungus joins on to the surface of the skin. Here, between the roots of the fungus and the body of the fish, are found hundreds of these creatures incessantly in motion and apparently eating vigorously. They are about $\frac{1}{40}$ of an inch in length and $\frac{1}{200}$ of an inch in diameter, and are provided with a mouth at one extremity, and at the other with about twenty claw-like appendages for fastening on to the fish on which they feed. They are continually eating into the tissues of the fish, and the twenty tentacles enable them to fasten on so tightly that the fish cannot shake them off. These parasites appear to live on the flesh of the fish, and the fungus to live on the digested matter into which they transform it.

This discovery led to some experiments in search of a remedy, and it was found that a strong solution of salt destroyed the parasites. Experiments were then made of immersing trout in salt water, and it was found to be perfectly harmless if not too long continued. A method was thus found of killing the parasites without killing the fish, which fact was confirmed by actually taking a trout covered with fungus and immersing him in a salt bath for a moment or two, and afterward keeping him by himself for

several days. The fungus peeled off, the parasites were killed, the bare spots healed over, and the trout got well. Others were tried; some died and some lived. From all which circumstances we may, I think, draw the following conclusions: That it is the worm, and not the fungus, which eats into and kills the fish; and that the fish can be cured, when not too much weakened, by immersion in a strong solution of salt. (I used a table-spoonful of salt to a pint of water, and kept the fish in it till he went over on his back, and then took him out and put him instantly into cold running water.) A similar series of experiments led to the discovery that salt is also a cure for the parasites on young fish. These parasites are smaller than those which infest the large fish. They have a circular form with a diameter of about $\frac{1}{50}$ of an inch. They are extremely thin, and progress by a rotatory movement. They sometimes swarm in immense numbers upon the young fish that are attacked by them. They do not cause a fungoid growth as the larger ones do in the larger fish, but the young trout affected by them appear outwardly as clean and well as ever. If the parasites are not removed, however, the trout will lose their strength, and drift toward the screen, on which they will be probably caught and die. Salt destroys the parasites and does not injure the young fry. It is, therefore a remedy for the parasites. Hundreds of experiments which I tried of putting the affected young trout in salt water had the same result, which was to kill the parasites and restore the fish. I will also add in this connection that the salt bath seems to improve the young fish in other ways than by killing the parasites, and one lot of young fry in particular, confined in a small box, which I cured in this way, and to which I gave a pint of salt every day, appeared better than any other young fish that I had. I have accordingly come to the conclusion that salt is beneficial to the young fish, and that large quantities can be used to advantage in the nurseries of the young fry, not only for the purpose of immersion, but to furnish an essential element in which the water has become deficient. All spring-water, it is said, contains a modicum of salt. Perhaps this slight trace of salt is essential to the health of the fish. If so, then salt ought to be supplied artificially when trout are kept in a spring stream where the supply of salt is insufficient.

BROOM-CORN CULTURIST AND BROOM-MAKERS' MANUAL. Giving directions for raising, cutting, curing, and preparing broom-corn for market, with notes on selling, shipping to market, &c., by R. A. Travers, Charleston, Illinois. Chicago: Rand, McNally & Co. Pamphlet, 30 pages. 1873.

The full title indicates the scope of the pamphlet. The writer, after an experience of twenty years in the broom-corn and broom business, aims to impart to others the lessons he has learned. He thinks that many farmers could make it an incident of profit added to their general vocation; this, by raising a few acres of broom-corn in summer and making it up into brooms in winter, when they and their boys cannot do much at anything else. The indoor-work is light and pleasant, and from one ton of brush of medium length 1,200 to 1,300 brooms may be made, which, at $3 per dozen, the price at the West when the pamphlet was prepared, would yield $300, or $100 per acre—taking three acres to make a ton of brush.

For market purposes, broom-corn may be raised at a cost of $50 a ton, the items being as follows: Rent, per acre, say from $3 to $9; plowing, $5; harrowing twice, $2; planting, $2; harrowing corn twice with walking cultivator, $4; breaking and cutting, $12; hauling, thrashing, and putting on poles, $10; wire and baling, $6; making in all (allowing liberal wages for the country) from $44 to $50 a ton, as the rent of land ranges from $3 to $9. At a cost of $50 a ton, it is considered a remunerative crop, since a good quality of broom-corn rarely sells for less than $100 per ton. If it were decided to raise large quantities, investing capital in machinery, it could be raised at a less cost per ton. It must cost more or less according to the efficiency, as to rapidity, of the cutters. Several objects must always be kept in view in the culture of broom-corn for sale, so as to command the highest price. To cut and cure it as green as possible, handle neatly, bale tightly, and in all cases to trim the bales with great precision and neatness at the ends.

This little pamphlet contains very many practical hints and suggestions which must prove of use to those engaged in the broom-corn business.

PROGRESS OF INDUSTRIAL EDUCATION.

All the land-scrip granted by Congress, under the act of July 2, 1862, for the benefit of industrial colleges, has been delivered by the Government to the several States, Arkansas and Florida having received theirs a short time ago. Twenty-six States have sold all the land which they received; Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, New York, and Wisconsin have sold only a part; and Nebraska, Nevada, and Oregon still retain theirs intact. The number of acres sold by the colleges of the States thus far is 7,868,473,* and the number remaining unsold is 1,237,844. No land has been sold recently for less than 90 cents per acre, and sales have been made by Kansas and Minnesota at an average of $4.33 and $5.45 per acre, respectively. In one instance New York sold 100,000 acres at $4 per acre, and 12,000 at $4.70 per acre. The amount already received by the colleges of the several States from the sales of the congressional land-scrip is $10,560,264; and the estimated value of the lands remaining unsold, reckoning them at their present market value, is $4,289,133.

Large additions have been made by many of the colleges to the endowment-fund derived from the congressional land-grant. Arkansas, Illinois, Indiana, Massachusetts Agricultural College, New Jersey, Ohio, and Pennsylvania have more than doubled, and Connecticut and New Hampshire have tripled theirs. Massachusetts Institute of Technology has increased its endowment fourteenfold, having added to it $900,000. New York and Ohio have added to theirs more than half a million dollars each; and Connecticut, Illinois, and Pennsylvania nearly the same sum, respectively. All the States, with the exception of a very few, have added something to the congressional land-scrip grant. These additions have generally been made in buildings, lands, and apparatus, yet several of the States have contributed largely in money. In some instances scholarships have been endowed by private donations, covering the tuition of students, and in others paying their entire expenses. In most of the colleges tuition and room-rent are free to all. Besides all these donations large sums have been given annually by many of the States to defray the current expenses of conducting the colleges. The amount which these colleges have received as donations from the States, counties, towns, and individuals is $7,292,841, not including the appropriations made for current expenses. A large part of this money has been given by individuals. Cornell University has received more than $1,500,000 from this source. By comparing the value of the property derived from the land-scrip received from the National Government with that derived from other sources it will be seen that for every $100 given to these colleges by the Government the people have contributed $69, or more than two-thirds as much. The entire property of all the colleges is valued at $17,535,475.

Colleges have been established in all the States except Louisiana and Nevada. In thirty-five States there are thirty-eight distinct colleges, and if we count two additional for the States of Georgia and Missouri, which have each two colleges in different parts of the State, but connected with one university and under one government, the number will

*Missouri is not included in this estimate, no full report having been received from the college of that State.

be increased to forty. All the colleges are in operation except in Florida, Indiana, North Carolina, and Texas. The number of professors and assistants at present employed in them is 389, and the number of students in attendance is 3,917. In fifteen of the colleges students occupy a portion of the time each day in manual labor on the farm or in the workshop. Attention is given by twenty-one of the colleges to raising thoroughbred stock for the purpose of giving practical instruction to students in this department of study, and also for aiding farmers in the several States in supplying themselves with the most approved breeds.

The stock is composed of cattle, horses, sheep, and swine, and numbers in all 1,618, valued at $82,146.. The farm implements on the same are valued at $47,047.

In the account which follows a detail is given of the operations and progress of each college, and a large amount of statistical information will also be found in the table at the close of the article.

ALABAMA.

Agricultural and Mechanical College of Alabama, at Auburn; Rev. I. T. Tichenor, D. D., president.—An additional farm, near the college, containing 100 acres, has been purchased during the year, and inclosed with a substantial plank fence. The college building has been improved, and the fences inclosing the college grounds have been entirely renewed. There are at present seven professors connected with the college. Of the 104 students entitled by the law of the State to be educated without charge for tuition, 31 have already entered the college. No system of manual labor for the students has yet been adopted, and sufficient time has not elapsed since the opening of the college on the 25th of March, 1872, to bring the farm into a proper condition for experimental purposes. Although the college is making rapid advances, it is considerably retarded in its operations from a want of an adequate income, having thus far received no appropriation from the State. There is also a great need of a building for the accommodation of the students.

The entire property of the college is valued at $327,500, as follows: Proceeds of Congressional land-grant, 240,000 acres at 90 cents per acre, $216,000, which sum was invested in Alabama State bonds, purchased at a discount, to the amount of $223,500; buildings, $100,000; farm, $2,000; apparatus, $2,000.

The number of students in attendance during the present collegiate year is 102, 53 of whom are pursuing agricultural and mechanical studies.

ARKANSAS.

Arkansas Industrial University, at Fayetteville; Albert W. Bishop, A. M., president.—A contract was made the 4th of July of the present year for the erection of a new university building to take the place of the temporary one now in use. It is to be built of brick, according to the description given in our report for 1871. The walls are already nearly completed, and the building will be finished and ready for occupancy by September 1, 1875. The agricultural department, called the College of Agriculture, has just been organized.

In addition to the president the university has two professors: T. L. Thompson, B. S., professor of theoretical and applied chemistry, and Richard Thurston, M. D., professor of practical and theoretical agriculture and horticulture. Although no course of study in agriculture has yet been prepared, 50 students who are attending the university have

received instruction in the agricultural operations of the farm, and labored two hours daily during the crop season. It is the determination of the trustees of the university that agriculture and the mechanic arts shall receive the attention contemplated by Congress in the act providing for the establishment of agriculture and mechanical colleges, and that the intention of the law shall be carried out in its full spirit as soon as the means of doing so can be made available. The land-scrip granted by Congress has been delivered to the State, and sold for $135,000, or 90 cents per acre, to Gleason F. Lewis, of Cleveland, Ohio, who has purchased the scrip of nineteen or twenty of the States. According to the contract the last payment was to be made on or before September 23, 1873. The money has all been paid as per agreement, and the college is now in a condition to enter upon a high career of usefulness and success. Provision has been made, by the act establishing the university, for the education of 219 students for four years without charge for tuition, and there are now 58 of this number receiving instruction in the institution. Some experiments have been conducted during the year on the farm in the cultivation of wheat, corn, and oats; and seeds furnished by the Department of Agriculture have been tested.

The entire property of the university at the present time, including the college of agriculture, amounts to $300,000, all of which, except the $135,000 from the congressional land-grant, was received from State, county, town, and private donations. It has also an appropriation from the State of $15,000 a year for two years, expiring June 30, 1875. The farm-stock and implements are valued at $360.

The number of students in the university for the present collegiate year is 241, 50 of whom have received some instruction in agriculture and 8 in the mechanic arts.

CALIFORNIA.

University of California—College of Science and the Arts, at Berkeley; Daniel C. Gilman, A. M., president.—This university has twelve professors, not including the president, one assistant professor, and four instructors. When fully organized it will include, according to the plan recently adopted, a college of letters; a college of science and the arts, including agriculture, mining, and engineering; a college of medicine; and a college of law. The first three are now in operation. The college of agriculture, as a distinct department with a separate course of study, has not yet been opened, but provision has been made in the scientific course by which students may select, in the junior and senior years, special studies relating either to agriculture, chemistry, or engineering, to which they give their chief attention. The studies in agriculture include, in the junior year, the chemical composition of agricultural plants, the plant as an organism adapted to perform a certain work, the material when wrought, the forces by which the work is accomplished, the relations of the plant to the atmosphere and to the soil, and the nature, origin, and composition of the soil; in the senior year, tillage, irrigation, drainage, reclamation of land, field-crops, sheep and cattle husbandry, forestry and arboriculture, sericulture, fruit and other special cultures, household and rural economics, with a part of the lectures mentioned under the preceding year. There will also be special instruction in the junior and senior years in veterinary science, diseases of plants, agricultural entomology, pruning and propagation, vine-culture and wine-making, dairy economy, farm implements and farm management, fish-culture, &c. Instruction is also given by experimental and

illustrated lectures, recitations, essays, class discussions, and in the practical application of principles on the college farm. Improvements have been commenced on the farm, and it will soon be brought into a condition for testing the capabilities of the State for the production of special field-crops, fruits, and forest-trees, and to ascertain the best processes and most economical methods of producing them. It is the intention of the regents of the university to provide labor for students, and to pay them a reasonable compensation as soon as practicable. No charge is made for tuition, and, besides this benefaction, the legislature has established five scholarships of $300 each.

During the present year two large buildings, located at Berkeley, have been completed and furnished, and were opened for students on the 24th of September. One is called North Hall, or the College of Letters, is built of wood, and contains the offices of the president, dean, faculty, and regents, the class-rooms of ancient and modern languages, mathematics, and history, and a lecture-room and an assembly-room capable of holding 400 persons. The other is called South Hall, or the College of Science. It is built of brick, and contains the rooms devoted to agriculture, metallurgy, chemistry, natural history, and geology; also the library and scientific cabinets. The new laboratories in the College of Science are large and convenient, and furnished with the best and newest apparatus and appliances for chemical instruction. One room is fitted up especially for conducting experiments in elementary chemistry by the freshmen and sophomore classes. The library of the university contains over 11,000 volumes, and the herbarium 1,000 specimens. It has also a valuable collection of ores, fossils, minerals, and metallurgical products, and is expecting soon to receive the collections of the California geological survey.

All the land-scrip, 150,000 acres, granted to the State by Congress, has been sold at $5 per acre, amounting to $750,000. The cash endowment-fund amounts, at present, to $613,000. Of this amount $135,000 are invested in State capital bonds, at 7 per cent., paid semi-annually; and the remainder, $478,000, principally in civil bonds, at 6 per cent. The annual income from this fund is $38,130. Some additional revenue is derived from other property. The college has received large appropriations from the State, and donations from individuals for erecting buildings, purchasing apparatus, &c. Edward Tompkins, of Oakland, made a donation of land, valued at $40,000. The entire property of the College of Science and the Arts, or the Agricultural and Mechanical College, so far as we have been able to determine from the data furnished, is as follows: Congressional land-scrip, 150,000 acres, $750,000; Agricultural and Mechanical College building, or College of Science, $200,000; one-half of 200 acres of land, used for the site of the university buildings at Berkeley, $100,000; one-half of the apparatus, used in common by all the departments, $12,500; one-half of the museum, $17,500; and one-half of the library, $7,500; making a total of $1,087,500. If to this amount we add the building of the College of Letters, $96,468; other property at Oakland, owned by the university, and valued at $189,500; property in San Francisco, $75,000; one-half of the 200 acres of land at Berkeley, $100,000; and one-half of the apparatus, &c., as given above, we have for the entire property of the university, including all the departments, the sum of $1,585,968.

Young women are admitted to the different departments of the university on the same conditions as young men. There are now 37 of the former in attendance. The number of students in the university during

the present collegiate year (1873) is 185, 93 of whom are in the college of science, 44 in the college of letters, 13 students at large, and 35 special students.

CONNECTICUT.

Yale College—Sheffield Scientific School, at New Haven; Rev. Noah Porter, D. D., LL. D., president.—This school has fourteen professors and nineteen assistants, five more of the latter than during last year, 1872. The number of professors and instructors in all the departments of the college is 82. The most important improvement which has been made during the present year is the completion of North Sheffield hall, which was ready for occupation in July. It has a front of 76 feet and a depth of 84 feet, and is four stories high besides the basement. The basement is 11 feet high; the first, second, and third stories are each 14 feet high, and the attic or fourth story 9½ feet high. The foundation-walls below the water-table are made of brown stone in courses, rock-faced. The water-table, window and door-sills are of blue stone, and the main walls of red brick, white fire-bricks and blue stone bricks being employed in band courses in the arches of the openings and in the cornices. In the basement there are two large rooms and one small room, completely finished, and suitable for recitation-rooms. The rear part of the basement under the lecture-room is occupied by a coal-room, heating-furnaces and boilers, janitor's room, and water-closets. On the first floor, or main story, above the basement, are a large lecture-room, occupying nearly half the floor, and four recitation-rooms. The second and third floors or stories are divided alike, having two large rooms of equal size on each floor over the lecture-room, and four rooms on each floor in the front of the building. The south side of the second story, consisting of three rooms, is devoted to physics; the north, consisting of three rooms, to civil engineering. The small rooms on the second floor in the front are, at present, appropriated to professors, the middle rooms are for apparatus and recitation-rooms, and the rear for apparatus, lectures, and drawing-rooms. The rooms on the south side of the third floor are devoted to dynamic engineering, the large room on the north side to natural history, the middle room to botany, and the front to the purposes of private study. The fourth story furnishes one large room 73 feet by 28 feet, for instruction in instrumental drawing, and eleven small rooms to be occupied as private rooms for instructors and store-rooms. The interior of the building is finished with yellow-pine coated with oil and shellac, and the staircase and wainscoting of the halls with pine, ash, and black-walnut. It is heated throughout by steam, and is thoroughly ventilated. Cost, with lot, $115,400.

"The Sheffield Scientific School," says the president, "received in 1864, by an act of the Connecticut legislature, the national grant for the promotion of scientific education under the congressional enactment of July 2, 1862, and thus became the College of Agriculture and the Mechanic Arts for Connecticut." The entire property of the school is valued at $614,000, as follows: Buildings and real estate, $216,000; permanent fund, $223,000; cabinets, libraries, apparatus, &c., $40,000; congressional land-grant, $135,000. All except the $135,000 received from the national Government has been derived from private donations.

There are 27 beneficiaries who are educated in this school without charge for tuition. The number of students in attendance during the present scholastic year is 242, being 85 more than during the previous year. The number in Yale College, including all the departments, is 955.

DELAWARE.

Delaware College, at Newark; William H. Purnell, A. M., president.—This college has five professors and one assistant professor. During the present year a normal department has been established in connection with the college for the education of teachers. All students who are not pursuing the classical course of study receive instruction in agriculture. The manual labor performed on the farm is voluntary. The college is required by the law of the State to educate thirty students without charge for tuition, and the trustees, since the establishment of the normal department, have provided free education for thirty more. The greatest obstacle which the college has at present to encounter is the want of funds, occasioned by the smallness of the congressional land-grant which the State received. Notwithstanding this embarrassment the number of students has largely increased since the last year.

During the last two years the college has received an appropriation of $2,000 annually from the State, which has been expended for defraying the salaries of the professors. No donations have been made by individuals. The land granted by Congress was sold for about 87 cents per acre. The entire property of the college is valued at $139,000, as follows: Congressional land-grant, 90,000 acres, $78,400; interest accrued, $4,600; buildings, $50,000; library and apparatus, $6,000.

The number of students attending the college in all its departments during the present collegiate year is 83, 14 of whom are pursuing the agricultural course.

FLORIDA.

Florida State Agricultural College; Hon. Jonathan C. Gibbs, president of the directors.—The 90,000 acres of land granted to this State by Congress, under the act of July 2, 1862, were delivered January 10, 1873. A contract had been previously made for its sale to Gleason F. Lewis, of Cleveland, Ohio, some time during the year 1872, at 90 cents per acre. The proceeds amounted to $81,000, and the money was paid in full on the 15th of October of the present year, 1873. Eighty thousand dollars of this sum were invested in Florida State bonds, bearing 6 per cent. interest in gold, to be paid semi-annually. The bonds were purchased for 80 cents on a dollar, and amount to $100,000. The $1,000 uninvested and the interest accruing on the fund amounted, at the close of the year, to $1,135, making a total, with the previous investment, of $101,135. If $1,001 be deducted for expenses incurred in securing the fund, $100,134 will remain as the entire property of the college.

The county of Alachua offered to the directors of the college to give $50,000 in cash and 20,000 acres of land, to be selected under their direction, and to secure free transportation on the Florida Railroad for all the materials necessary to be used in the construction of the requisite buildings, if they would locate it in that county on the line of the Florida Railroad. The proposition was unanimously accepted, and the town of Gainesville was suggested as the place most eligible for its location. The executive committee of the directors proceeded to that place in June of the present year for the purpose of perfecting the location of the college there, but failed to accomplish their object on account of the inability of the citizens of the county to comply, at that time, with the conditions of the guarantee upon which the location was provisionally made. The committee have the subject of the location now (December, 1873,) under consideration, and are in confident expectation that it will be fixed in a few months, and that the State will soon have an agricultural college in full operation.

GEORGIA.

University of Georgia—Georgia State College of Agriculture and the Mechanic Arts, at Athens; Rev. A. A. Lipscomb, D. D. LL. D. chancellor.—There are eight professors including the president, William Le Roy Broun, A. M., and four instructors in this college. The professorship of natural history and physiology remains to be filled. The city of Athens has given during the present year $25,000 for the purpose of erecting a new laboratory building for the college. It is to be 50 feet wide and 100 long, and three stories high, with a basement. The first floor and basement will be appropriated to the department of chemistry, and will contain analytical laboratories, balance-room, store-room, a room for agricultural analysis, and a lecuture-room. The second floor will contain a physical laboratory, apparatus room, working room, and a lecture-room. On the third floor will be a model-room, lecture-room for students in engineering, and a drawing-hall. A large amount of apparatus has been purchased for equipping the laboratory, for which individuals, citizens of Athens, have contributed $3,000.

The professor of chemistry is engaged in analyzing commercial fertilizers, and publishing the results of his investigations for the benefit of the farmers of the State. Ten different kinds have been already analyzed, and their composition and value published. Two hours a day are devoted by the students to practical exercise in chemical analysis, and this work is continued until each has become competent to determine the chemical constituents of an unknown substance presented to him. Those who take the course of applied chemistry will be required to work in the chemical laboratory, during the last year of their course, five hours daily for six days in the week. Attention is also given to drawing during a part of the course for two hours each day. No system of manual labor has been adopted for work on the farm. About thirty-five experiments have, however, been conducted on ten acres, some of which will be published. The number of free scholarships is equal to the number of the members of the general assembly of the State, which is now 220. To this number the trustees of the university have added 30. A fee of $5 for the first term and $10 for the second will be demanded for each laboratory student for the use of cheminals, and a common apparatus will be furnished for each, at a cost not exceeding $10, which will be considered as his property.

The entire property of the college of agriculture and the mechanic arts is valued at $271,000, as follows: Congressional land-grant, 270,000 acres, at 90 cents per acre, $243,000;* donation from the city of Athens for building a laboratory, $25,000; donation by citizens of Athens for apparatus, $3,000. The buildings now erected, the library, and most of the apparatus are the property of the university, and are used in common by both. They are worth $200,000.

In speaking of the progress of the college the president says: "This college has inaugurated a noble work in Georgia. By its free tuition it is educating a class of young men who, in a few years, will become the pride of the State. In my opinion the donation of land by the General Government for the establishment of agricultural and mechanical colleges will prove to be the most profitable investment that it has ever made with a similar amount of money. They give just the education

* Of the interest derived annually from this fund, at 7 per cent., $2,500 are paid to the North Georgia Agricultural College, at Dahlonega, which sum is equal to the interest on $35,714, and practically the fund of the college at Athens is diminished by this amount.

which the age demands, and which the South especially so much needs. It should be remembered that they are now in their infancy, and need the generous support of all the friends of true progress; and if they are made what they should be, our country will become unequaled in intelligence and power."

The number of students attending the college during the present collegiate year is 151, all of whom are pursuing agricultural and mechanical studies. In the university, including all the departments except North Georgia Agricultural College, the number is 312; including that college it is 521.

North Georgia Agricultural College, at Dahlonega; Rev. A. A. Lipscomb, DD., LL. D., chancellor.—This college has been in operation one year, having been opened January 1, 1873. It has an agricultural and mechanical, a normal, and a primary department, four professors, including the president of the college, Hon. David W. Lewis, A. M., and four assistants. The people in the section of the State in which the college is located having hitherto been deprived even of common-school advantages, are rallying around this infant institution with enthusiasm, and the number of students for the present collegiate year (1873) is swelled to 209, 122 of whom are males and 87 females. Twenty-five pursue agricultural and 20 mechanical studies. Sufficient time has not yet elapsed for maturing permanent courses of study for the several departments of the college. Instruction is given in reading, geography, arithmetic, grammar, book-keeping, history, rhetoric, natural philosophy, chemistry, physiology, botany, geology, mental philosopoy, algebra, geometry, surveying, and the Latin and Greek languages. Measures will be taken at the earliest opportunity to provide for special instruction in agriculture. The trustees say: "Our means have been too limited to put our grounds (10 acres) in condition for successful teaching and illustration of those subjects directly relating to agriculture. This will be done, however, when we have the means at hand. We contemplate at an early day putting a portion of our land under the care of an experienced fruit-grower, who will be able to instruct pupils in the growth, culture, and diseases of fruit-trees, and who will also be able to lecture on the diseases of domestic animals." It is intended also to introduce the manual-labor system next year, by separating the male students into divisions, each division being required to work one day in a week on the farm under the direction of a competent superintendent, and with the double object of instructing the students in agriculture, and of furnishing them the means of defraying a part of their expenses for board, books, &c. The professors of the University of Georgia will also give lectures, at stated times, on subjects connected with the studies of the college.

This college is strictly a branch of the University of Georgia. An agreement was made between the trustees of the University of Georgia, to which the proceeds of the congressional land-grant were given, and the trustees of North Georgia Agricultural College that the college, with all its property, should become "a part and parcel of the University of Georgia;" that the trustees of the college should have the privilege of choosing its professors; of directing its government and local interests, and of transferring, after proper preparation, to the university 30 students, who are to be educated in its College of Agriculture and the Mechanic Arts without charge for tuition. The trustees of the university have the right of electing the president of the faculty of the college. The North Georgia Agricultural College appears to hold, at

present, the position of a preparatory department of the College of Agriculture and the Mechanics Arts of the University. By the same agreement between the trustees of the two institutions, the North Georgia Agricultural College was to receive annually, in interest on the proceeds of the congressional land-grant, the sum of \$2,000 which, by a subsequent arrangement, was increased to \$2,500. As the proceeds of the congressional land-grant are invested in Georgia bonds, bearing 7 per cent. interest, the college has actually an interest-bearing fund, from this source, of \$35,714. It has a private endowment fund of \$3,000, being a portion of a donation of \$4,200 made by Hon. William P. Price, president of the trustees, which is invested in 8 per cent. Georgia bonds, placed in the hands of the treasurer of the State for safe-keeping. It has a subscription to this fund amounting to about \$2,000, and has also received this year \$350 from the Peabody fund, which it is expected will be increased to \$450 in 1874. Seventeen persons have also agreed to contribute \$20 each, and one \$50, to be paid on the college commencement-day of each year for five years. The college building and the 10-acre lot on which it is located cost the United States Government, in 1835, \$70,000, and is worth considerably more at the present time. The act of Congress, approved April 20, 1871, by which the property was conveyed to the trustees of the college is as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury be, and is hereby, authorized and directed to convey to the trustees of North Georgia Agricultural College, located in the town of Dahlonega, Georgia, the building known as the United States branch mint, at Dahlonega, and ten acres of land connected therewith, located on the lot of land number nine hundred and forty-nine, in the twelfth district of the first section of Lumpkin County; said conveyance to be made by the Secretary of the Treasury so soon as he is assured that the said trustees have been properly incorporated by the laws of Georgia, and on the express condition that said building shall be used exclusively for educational purposes, and in conformity with the provisions of the act entitled "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts."

The entire property of this college, not including the \$35,714 of the proceeds of the congressional land-grant now in the hands of the trustees of the University of Georgia, on which the college draws interest, is valued at \$75,000, as follows: College building and grounds granted by Congress, \$70,000; donation by Hon. William P. Price, \$3,000; subscription by other citizens friendly to the college, \$2,000. All students from the State are admitted without charge for tuition, an admission-fee of only \$5 being charged for wood and repairs on the college building, which will be relinquished as soon as means can be provided from other sources for defraying these expenses. Board in good families is furnished for \$8 to \$12 per month, and houses and cottages can be rented for private boarding at \$2.50 to \$5 per month.

ILLINOIS.

Illinois Industrial University, at Urbana; John M. Gregory, LL. D., regent.—This university has thirteen professors and seven instructors and assistants. The new university building, a description of which was given in the report of this Department for 1871, and an engraving of the same in that of 1872, has been completed during the present year, and affords ample facilities for conducting the operations of the different departments successfully. A new physical laboratory has also been added to the other improvements. Three thousand dollars were appropriated by the legislature of the State for furnishing it with apparatus, all of which has been collected, and is now ready for use. A part was

purchased in Europe and the remainder has been manufactured in the mechanical department of the university, and is said to be of the very best quality. Extensive experiments have been made in the culture of different varieties of plants, in forest-planting and stock-feeding, a detailed account of which will be given in the annual report of the university.

The manual labor-system has been adopted. The labor is of two kinds, educational and remunerative. Educational labor is designed for practical instruction, and as it is a part of the course in the technical schools, it is not paid for. Remunerative labor is prosecuted for its products. It is voluntary, and is paid for according to its worth, the maximum price being 10 cents per hour. Students wishing to work join the labor classes, which go out two hours a day, or four hours on alternate days. Good workers can get extra work if they desire it. Some pay their way by working. In all the departments students are educated without charge for tuition. An entrance-fee of $10 is required, $5 per term for incidentals, and $4 for room rent. The stock kept on the stock-farm is valued at $6,200, and the engine, tools, and implements at $5,956; the implements on the horticultural farm are valued at $562.

The entire property of the university is valued at $866,308, as follows: Congressional land-grant, 454,560 acres, sold at about 70 cents per acre, $319,494 invested in bonds; congressional land-grant, 25,440 acres unsold, valued at $3 per acre, $76,320; other bonds, $104,506; stock-farm, including stock and implements, $51,366; horticultural farm, including implements, $34,965; green-houses and plants, $4,135; machine-shops, $7,082; carpenter-shops, $3,601; civil engineering departments, $1,637; chemical laboratory, $6,007; physical laboratory, $1,956; library, $16,868; cabinets, $3,758; buildings, $232,300; furniture, $2,313.

The number of students attending the university during the present collegiate year is 402; 328 of whom are males and 74 females. Of the whole number in the university 87 pursue agricultural and 74 mechanical studies.

INDIANA.

Purdue University—Indiana Agricultural College, at La Fayette; Richard Owen, LL. D., president.—This institution has not yet been opened for students, but it is announced by the trustees that it will be during the next year, 1874. None of the faculty except the president and the professor of chemistry, J. H. Hougham, A. M., have been elected; the remaining chairs will, however, soon be filled. During the present year a dormitory containing thirty-two suits of rooms, three rooms to a suit, and costing $35,000, has been completed; also a boarding-house costing $33,000, and a laboratory on the plan of the new laboratory of Brown University, costing $15,000. A farm-house, gymnasium, and military hall will be built immediately. It is in contemplation also to build a barn for the farm-stock, at a cost of $10,000, as soon as an appropriation can be obtained from the legislature for the purpose. The basement of the college building has been finished, and it is proposed to complete the entire edifice during the coming year.

The land-scrip granted by Congress was sold in 1867 for $212,238, and by judicious management this fund now amounts to $340,000. The institution has received several liberal donations, which have been used for the purchase of land and the erection of buildings. Mr. John Purdue gave $150,000, to be paid in yearly installments of $15,000; the citizens of Chauncey, in Tippecanoe County, donated 100 acres of land valued at

$50,000; Tippecanoe County gave $50,000, payable in yearly installments of $10,000; and the State has appropriated $60,000, one-half of which was paid in June of the present year and the balance will be paid in June, 1874. No stock is kept on the farm at present. The entire property of the university and college is valued at $510,000, as follows: Congressional land-grant, 390,000 acres, at about 54.4 cents per acre, $212,238; interest accrued, $127,762; lands, buildings, and apparatus, $170,000.

IOWA.

Iowa State Agricultural College, at Ames; A. S. Welch, LL. D., president.—This college has ten professors and six instructors. Some changes have taken place during the present year. Professor I. P. Roberts has resigned the professorship of agriculture, and accepted a similar position in Cornell University; also A. H. Porter, C. E., has been elected professor of civil engineering, and E. R. Hutchins, M. D., professor of chemistry. Plans and specifications for a new physical laboratory have been adopted by the trustees, and the building is now in process of erection. A barn has also been built at a cost of $4,916. It is 70 feet long and 54 wide, surmounted by a ventilating cupola. The basement is arranged for stabling 48 head of cattle, with the necessary breeding and calf pens, and a root-cellar capable of holding 4,000 bushels. There is a drive-way on the principal floor 16 feet wide, and running the whole length of the barn. On either side of the drive-way are five rooms, each 14 by 19 feet, one of which is for a herdsman's room, one for farm implements, four for granaries, and four for breeding-boxes. Over these rooms and a part of the drive-way is a space for 150 tons of hay, with shoots for carrying it to the basement. The barn has a wing designed for a wagon-shed, 62 by 24 feet, with posts 12 feet in length. Under the wing is a stone basement 9 feet high, containing a covered passage and four bull-boxes.

Additions have recently been made to the illustrative equipments of the college. The sum of $2,000 was expended last year for apparatus, illustrative of light and heat, including Melloni's and Tyndall's. This year (1873) $2,500 have been paid for electrical apparatus, and $2,000 will be expended for machinery for the machine-shop. The physical apparatus is very complete, having been imported mainly from Europe. It consists of the finest instruments of the kind, and adapted to the determination of the most exact results. The chemical laboratory has recently been furnished with furnaces, sand-baths, hoods, balances, filter-pumps, and other apparatus for general and analytical chemistry, and $2,000 a year will be expended for the next two years for additional articles as the wants of the laboratory require them. The college has also a fine collection of mammals, birds, reptiles, and insects, illustrating the fauna of the State; a herbarium containing 2,500 specimens, besides grains and textile materials from the Paris exposition of 1867; a complete series of geological specimens collected during the State survey; and a series of 1,000 models of rare and interesting fossils.

Eighty-six students have received instruction in laboratory practice. Among other experiments four hundred and sixteen have been written out for the class of the present year by the professor, including the new flame tests of Professor Bunsen, of Heidelberg, never before published in the United States. The professor of agriculture has instituted a series of experiments on the college farm which will be conducted with great accuracy, with the expectation that they will result in the establishment of facts which will render the science of agriculture more

complete and place it on a surer basis. None of them have yet been completed. The professor of pomology has plated five acres with seeds of forest trees, embracing black walnut, butternut, and shell-bark hickory, and hopes to plant twelve or fifteen acres more next year. By long experience he has found that grape-vines can be made sufficiently hardy for that portion of the State in which the college is located only by grafting the desirable varieties on the collar of the Taylor or Bullett, and pears by grafting certain varieties on the white thorn (*Cratægus coccinea.*) Students are required to labor daily two and a half hours under the immediate superintendence of the professor of agriculture. For heavy work on the farm, not designed for instruction, they are paid 3 to 9 cents per hour. Those employed in skilled labor in the garden, orchard, or ornamental grounds are paid 3 to 7 cents per hour. There are kept on the farm this year 337 domestic animals—17 horses and mules, 18 short-horns, 2 Devons, 6 Ayrshires, 4 Alderneys, 10 native cows, 15 half-blood Durhams, 47 young cattle of one-half or two-thirds blood, 135 sheep, and 83 swine.

The college has received in appropriations from the State $292,750, and from county donations and individuals $21,355, making a total of $314,105, all of which has been expended for buildings, farm, apparatus, and improvements. The entire property of the college is valued at $968,899, as follows: Congressional land-grant, 5,047 acres sold at about $2.33 per acre, $11,742; congressional land-grant, 199,262 acres unsold, valued at $3 per acre, $597,786; buildings, $275,500; experimental farm (878 acres) with improvements, $40,000; farm-stock, $12,839; farm implements, $11,032; apparatus, $16,000; library, $4,000. The annual income from the productive fund and the rent of lands unsold is, on an average, about $32,000.

The number of students in attendance during the present collegiate year is 263, 243 of whom are pursuing the agricultural course and 20 the mechanical.

KANSAS.

Kansas State Agricultural College, at Manhattan; John A. Anderson, president.—Some changes have been made in this institution during the year. John A. Anderson has been elected president, and three professors, M. L. Ward, J. S. Whitman, and William K. Kedzie, have been added to the faculty. A new curriculum of study has also been established, and $1,300 have recently been expended in purchasing apparatus and equipping the chemical laboratory. The board of regents announce that "no difference will exist between the Kansas State Agricultural College and the best literary institutions, except that its curriculum, methods, and appliances will be speedily adapted to an industrial as distinguished from a professional education." There are now three principal departments—literary, agricultural, and mechanical. The courses of study are arranged with special reference to the peculiar wants of the students. The literary course occupies four years. Provision is made for four courses of study in the industrial departments: The farmer's, the mechanic's, the commercial, and the woman's. The full curriculum comprises six years, and will give the graduate an education equal to that obtained in the best American colleges, while the student who is unable to graduate can acquire from year to year a thorough knowledge of such branches as will be most useful to him in the business which he intends to pursue.

In order to carry out more fully the objects contemplated in the establishment of the college the regents have provided, in addition to

the farm and nurseries, shops for the convenience of conducting the mechanic arts. They consist of carpenter, wagon, blacksmith, paint, and harness shops; also shops for women, in which they are instructed in dairying, in the use of the most popular kinds of sewing-machines, in dress-making, photography, engraving, telegraphing, printing, &c. A stock-barn 46 feet wide, 96 feet long, and two stories high has recently been built on the farm, and fitted with the most approved modern conveniences. The stock consists of 3 horses, 6 mules, 17 blood-cattle, besides several approved breeds of swine and fowls. The committee to whom was referred the examination of these animals at the State fair reported five head of short-horns, which, for excellence, style, character of pedigree, and condition, were equal at least to the best in the State; and three head of imported prize-taking Devons, two head of prize Jerseys, and two head of black Galloways which were first-class in quality. The Berkshire, Essex, short-faced Lancashire, Chester White, and Poland China varieties of swine were represented by prize-winning animals.

The nursery is now the largest and most valuable west of the Mississippi. It occupies 67 acres, and contains 45,000 fruit and forest-trees. The latter cover 24 acres, and the apple-trees number 650 varieties. Elaborate experiments have been conducted on the farm in the cultivation of wheat and corn, a detailed account of which is given in the article on farm experiments, found in another part of this report. There have been cultivated on the farm the present year wheat, rye, broom-corn, buckwheat, barley, oats, millet, flax, three varieties of the potato, five varieties of the sugar-beet, two varieties of corn said to have yielded 75 bushels per acre, timothy, clover, hemp, and castor-beans. Labor is compulsory, each student being required to work one hour daily, as educational labor, without pay. For any labor beyond this he is paid 3 to 12 cents per hour.

Of the 82,216 acres of the congressional land-grant, 45,391 have been sold at an average price of $4.33 per acre. The remaining 36,825 acres are valued at $190,000. The college has received in donations, exclusive of the congressional grant or other property from the national Government, $25,000 in buildings and grounds, $3,000 in improvements of buildings and grounds, and $2,000 in bonds of Manhattan Township. None of these donations have gone to the permanent interest-bearing fund. The entire property of the college at the present time amounts to $458,782, as follows: Invested funds, $185,469; lands unsold, valued at $190,000; college site and farm, $30,000; buildings, $31,000; apparatus and cabinets, $10,000; library, $3,000; nursery-stock, $2,500; teams, cattle, and swine, $5,838; farm implements, $975.

The college has nine professors and five assistants. Tuition is free to all. The number of students in attendance during the collegiate year is 217. Fifty attend to agricultural studies and the remainder to mechanical, as follows: 10 to blacksmithing, 6 to wagon-making, 35 to carpentry, 5 to painting, 12 to dress-making, 48 to type-setting, and 74 to telegraphy. Some attend to more than one of these branches of industry.

KENTUCKY.

Kentucky University—Agricultural and Mechanical College, at Lexington; John B. Bowman, A. M., regent.—No important changes have been made in this college during the present year, and it appears to be enjoying its usual prosperity. It has nine professors and assistants. In the university, including all the departments, there are thirty. A large

amount of labor has been performed on the farm, which is principally practical, being designed not only for instruction but also for profit, and to afford employment for students who desire to pay a part of their expenses by their own industry. Four hours are devoted to labor daily. No important experiments have been conducted on the farm during the present year. There are eighty-one students in the college who are being educated without charge for tuition, and the number for which provision has been made by the State is three hundred. The entire property of the college is valued at $311,000. The congressional land-grant, 330,000 acres, was sold at 50 cents per acre, and amounted to $165,000; the domestic animals, 100 in number, kept on the farm, are valued at $5,000; the farm implements, at $1,500; and the experimental farm, work-shops, machinery, &c., make up the remainder. The property of the university, including all the departments, is valued at $802,254.

The number of students attending the Agricultural and Mechanical College during the present collegiate year is 181, all of whom pursue agricultural or mechanical studies. The number in the university, including all departments, is 558.

LOUISIANA.

Although diligent effort has been made, we have not been able to get any report from this State in regard to the establishment of an agricultural and mechanical college. None had been established a year ago, and probably the same is true at the present time.

MAINE.

Maine State College of Agriculture and the Mechanic Arts, at Orono; Rev. Charles F. Allen, D. D., president.—This college, as at present constituted, has four professors, one assistant professor, two instructors, two assistant teachers, and two lecturers. X. A. Willard, A. M., lectures on dairy farming, and James J. H. Gregory, A. M., on market farming and gardening. The chair of chemistry is now vacant, but will be filled at the earliest opportunity. The usual amount of farming and farm experimentation has been carried on during the year. The students of the freshmen class labor three hours daily on the farm during five days in the week, for which they receive pay. The maximum price is 10 cents per hour. The other classes are employed the same number of hours in educational labor in the laboratories, cabinet, field-surveying, and other practice. Experiments have been made in testing the merits of raw and cooked Indian corn-meal for feeding swine; the value of different commercial fertilizers in the culture of sugar-beets and the Orono variety of the potato, and as a top-dressing for grass-land; the effect of different methods of cutting and planting potatoes; and the comparative values of 120 varieties of the potato employed in cultivation. In the experiment with Indian corn-meal it is found, after three successive years of trial with the same result each year, that raw meal is preferable to cooked as food for swine; and in the experiment with the 120 varieties of the potato the Orono, Early Rose, and Excelsior prove to be the best for Maine. The severe drought operated to prevent arriving at any satisfactory conclusions in rsepect to the effects of different fertilizers, and more time is required to test the influence of different modes of preparing and planting potatoes. There are kept on the farm 55 domestic animals—5 horses, valued at $1,200; 27 Durham,

Jersey, and grade cattle, $985; 8 Chester and Essex swine, $145; 15 Southdown and Cottswold grade sheep, $90. Total value, $2,420. The farm implements are valued at $900.

The college has received, exclusive of the congressional land-grant, $152,700, viz: From the city of Bangor, $12,700; from Orono and Old Town, $11,000; from the State, $128,000; from Hon. Abner Coburn, $1,000. The entire property is valued at $258,620, as follows: Congressional land-grant, 210,000 acres, at 56½ cents per acre, $118,300; interest accrued, $16,000; farm and farm buildings, $11,000; domestic animals and farming implements, $3,320; college building, $100,000; apparatus, library, and cabinets, $10,000.

The number of students in attendance for the collegiate year 1873 is 103, all of whom attend to agricultural and mechanical studies. There has been a gain of 32 students over last year. Tuition is free to all students from the State.

MARYLAND.

Maryland Agricultural College, near Hyattsville; General Samuel Jones, president.—This college has five professors and one adjunct professor. During the present year General Samuel Jones has been elected president in place of Rev. Samuel Register, D. D., resigned. A barn, workshop, and gymnasium have been erected, and other important improvements made. The manual-labor system has not been fully adopted, although students labor occasionally on the farm for illustration of the studies pursued, or for profit. Sixty students, twelve from each congressional district, are permitted by the law of the State to be educated in the college without charge for tuition or the use of books. Provision has also been made by the trustees by which a number of students, not exceeding ten, may pay a part of their board by their labor, and all are now admitted free of tuition. Some experiments are now in progress in the cultivation of different crops, but they have not been carried far enough to arrive at any important results.

The college has an annual appropriation of $6,000 from the State, which is devoted to the payment of current expenses. It has also received from the State an appropriation of $45,000, which has gone to the permanent fund in the form of buildings or for other purposes. The congressional land-grant, 210,000 acres, was sold for about 53 cents per acre, amounting to $111,000. The buildings are valued at $60,000; the experimental farm, $13,500; apparatus, $1,200; domestic animals, $2,000; farming implements, $1,000. Including other items not here enumerated, the entire property of the college is valued at $210,000.

The number of students attending the college during the present collegiate year is 130, all of whom are pursuing agricultural and mechanical studies.

MASSACHUSETTS.

Massachusetts Agricultural College, at Amherst; William S. Clark, Ph. D., president.—This college has eight professors, one assistant professor, and two lecturers. During the present year Noah Cressey, M. D., has been elected professor of veterinary science in place of Professor Henry J. Clark, B. S., deceased. Hon. William Claflin has made a donation of $1,000 for the endowment of two prizes to be awarded annually to the two members of the graduating class who pass the best oral and written examinations in the theory and practice of agriculture. They are to be called the "Grinnell agricultural prizes," in honor of George B. Grinnell, esq., of New York. Isaac D. Farnsworth, esq., of Boston, has provided a fund of $1,500, the interest of which is to be used for the

purchase of gold and silver medals to be awarded annually to students who excel in declamation. The Massachusetts Society for Promoting Agriculture has established four free scholarships at an annual expense of $300. All other students pay tuition, which is $75 per year. Professor S. H. Peabody offers a prize of $20 to the student who will make the best collection of insects, containing not less than 250 species found on the college estate, during the collegiate year 1874. A prize of $15 will be given for the best herbarium collected by a member of the class of 1875, and $10 for the second best; also, $5 for the best collection of woods. Hon. Marshall P. Wilder has presented a collection of plants and many specimens of fruits, carefully named, which have been modeled for the museum.

Students labor three hours a day for two days in a week in cultivating crops, taking care of stock, and in improving the farm. Fifty-five acres of the farm have been cultivated with tilled crops, on which have been raised 860 bushels of ears of corn, 552 bushels of potatoes, 96 bushels of oats, 52 tons of turnips, 270 boxes of small fruits, and a large variety of other crops. One hundred and twenty acres of mowing-land produced 135 tons of hay. There are kept on the farm 50 thoroughbred cattle of the short-horn, Ayrshire, Holstein, Jersey, and Brittany breeds; 9 horses, 30 Berkshire, Essex, and Chester White swine, and 5 Cottswold sheep, the whole valued at $10,650. The farming implements are worth $2,634. The junior class, under the direction of Professor Maynard, have prepared a large tract of land, called the Massachusetts garden, which is designed to contain all the indigenous trees, shrubs, and herbaceous plants of the State. A plantation of several hundred Norway spruces, Scotch larches, and Scotch and Norway pines has been made for shelter belts to grape-vines, and also for testing their adaptability to timber-planting on the barren hills of Massachusetts. Several thousand trees and shrubs of various species have also been set in the nursery.

An extensive series of investigations has been conducted by the president and professors of the college upon the circulation of the sap in the sugar-maple and other trees and shrubs. These observations are very elaborate, and impart much new information on this interesting and important subject. On presenting these investigations before the board of agriculture at Fitchburg, (in December, 1873,) Professor Agassiz made the extraordinary statement that the production of this one paper was an ample return for all that had been expended on the college; and Dr. George B. Emerson, the author of the Report on the Trees and Shrubs of Massachusetts, added that, "under the feeling which it produced in him, he would, if he had a hundred thousand dollars to give, send it all to the college at once." Professor Goessmann has made numerous experiments on the college farm in the cultivation of the sugar-beet, and the effect of various fertilizers and modes of culture upon its size and quality, and it is believed that important results have been attained. A detailed account of all these investigations may be found in the annual report of the Massachusetts Board of Agriculture for 1873–'74.

The college has received in donations from the State and other sources $400,000, a part of which has been devoted to current expenses; and from the congressional land-grant $167,464. The entire property of the college is valued at $491,784, as follows: Endowment fund, $253,500; buildings, $162,500; college farm and quarry, $37,500; live-stock on farm, $10,650; farm implements, $2,634; apparatus and cabinets, $25,000. A catalogue has been prepared of all the students who have attended this college, and it has been found that 70 out of 234 have engaged in farming or

kindred business, and nearly all the remainder in industrial pursuits; thus showing that the assertion that education prevents young men from engaging in agricultural and other industrial pursuits is not well founded.

The number of students in attendance during the present collegiate year is 139.

Massachusetts Institute of Technology, at Boston; R. D. Runkle, Ph. D., LL. D., president.—This institute has 23 professors and 13 assistants. The number of students has become so large that it has been found necessary to petition the State legislature for land on which to erect a new laboratory building for their accommodation in pursuing their studies in the different departments of chemistry, mining, and metallurgy; and by an act approved April 8, 1873, a lot was granted to the trustees in the part of Boston called the Back Bay. It is located at the intersection of Boylston street and Huntington avenue, and contains 13,194 square feet. An effort is being made to erect the building during the coming year, 1874. The course of study in chemistry and the cognate branches is very thorough, and the exercises have been conducted during the past year and the present by the use of German text-books, thus enabling the students to acquire a critical knowledge of the principles of chemistry and a good acquaintance with the German language, which is the key to an immense store-house of science both theoretical and practical. Although the time devoted to original investigations in this country is comparatively short, yet four very creditable papers have been prepared by students in the two higher classes during the present year, and have been published in a scientific journal. Three of them are devoted to the investigation of analytical methods, and announce the discovery of new facts. The mining and metallurgical laboratories are ample and select, and are said to be the only ones of the kind, either at home or abroad, connected with a systematic course of instruction, and a required part of it. Engravings and descriptions of the mining and metallurgical laboratories, and also detailed accounts of work performed and experiments conducted in them during the year, are given in the president's report of the institute for the year ending September 30, 1873.

The corporation of the institute has established a loan-fund which will give aid to 20 students each year to the extent of their tuition. The student's note is taken without collateral security, and a receipt is given him for the amount. The note is to be paid at a stipulated time when the student is in a condition to cancel it. This plan is found to work well, and is preferred to scholarships by most students, as it relieves them from the idea of depending upon charity for their support.

The land granted by Congress to Massachusetts was sold at an average price of 65⅗ cents per acre, and this institute received one-third of the proceeds after deducting one-tenth for the purchase of the agricultural-college farm. The entire property of the institute is valued at $968,843, as follows: Congressional land-grant, $68,843; land granted by the State, located in the city of Boston, $300,000; donations from individuals, $600,000.

The number of students in attendance during the present collegiate year is 375, an increase of 19 over the past year.

MICHIGAN.

Michigan State Agricultural College, at Lansing; T. C. Abbot, LL.D., president.—This college has six professors and one assistant professor. There has been considerable increase in the number of students over

the last year. Great pains are taken from year to year to enlarge the facilities for illustrating the branches taught in the recitation-room and to make the college as far as possible strictly an agricultural and mechanical institution. For this purpose a farm of 676 acres has been provided, 300 of which have been under cultivation during the present year. There is a large herd of stock, consisting of the Galloway, Ayrshire, Durham, Jersey, and short-horn breeds; also Essex, Berkshire, and Suffolk swine; Southdown, Cotswold, Lincoln, Spanish merino, and black-faced Highland sheep; botanical gardens of trees, shrubs, and herbaceous plants, and a green-house; vegetable gardens, small-fruit garden, apple-orchard, pear-orchard, general lawn, and grounds; a very large herbarium, museum of vegetable products, chemical laboratory and apparatus, philosophical and mathematical apparatus, museum of mechanical inventions, museum of animals and minerals, and a reading-room and library of 3,000 to 4,000 volumes. Students are required to labor three hours daily on the farm five days in each week. The highest price paid for labor the present year has been 7½ cents an hour. All students from the State are educated without charge for tuition; others pay $20 a year. Extensive experiments have been conducted on the farm, a full account of which will be given in the report of the college, which is not yet published.

This is the oldest agricultural college in the United States, and one of the wealthiest, having been opened May 13, 1857. It was founded by the State, and supported by it entirely until the transfer of the national land-scrip, March 18, 1863. Since 1862 it has received from the State $175,500 for current expenses, and $80,000 for building purposes. The land-scrip granted by Congress amounted to 240,000 acres, but it received only 235,673 acres, some of the selections being within railroad grants. Of this sum 64,599 acres have been sold at an average price of about $3.21 per acre, amounting to $207,501. The entire property of the college is valued at $929,699, as follows: Congressional land-grant sold, 64,599 acres, $207,501; congressional land-grant unsold, 171,074, acres valued at $3 at least per acre, $513,222; buildings, apparatus, farm, &c., $195,531; domestic animals, $10,191; farming implements, $3,254.

The number of students attending the college during the present collegiate year is 143, nearly all of whom pursue agricultural and mechanical studies.

MINNESOTA.

University of Minnesota—Colleges of Agriculture and the Mechanic Arts, at Minneapolis; William W. Folwell, A. M., president.—The present year marks an era in this university, being the first since its opening in 1869 in which a class of students has completed the full course of study and graduated. Great activity is manifested on the part of the regents and the faculty in extending its operations and carrying out more fully the objects for which it was established. Fifty thousand dollars were appropriated by the legislature of the State at its last session for building purposes, and the board of regents have decided to erect a building for the college of agriculture, and also to add to the present university building a main central portion as originally contemplated. Plans and specifications of both these buildings have been prepared and adopted by the board of regents, and the erection of the college of agriculture has already been commenced. The plan embraces a main building, of brick, 54 by 54 feet, flanked on each side by a wing 25 by 46 feet. The east wing, designed for a plant-house, is to be built of wood and glass; and the west wing, designed for a laboratory, of brick. The building will be of sufficient size to afford ample accommodations for all the pur-

poses for which it is needed. It is expected that the legislature at its next session will make another appropriation sufficient to complete both buildings according to the plans, and they will probably be ready for occupation at some time during the year 1874.

There are five professors and five instructors connected with the Colleges of Agriculture and the Mechanic Arts; and in the university, including these colleges, nine professors, one assistant professor in Latin, (Helen Sutherland, A. M.,) and five instructors. A course of lectures was given during the winter term, by Dr. Charles N. Hewitt, non-resident professor of public health, on the following subjects: Public health as a condition of national education and culture, with a historical review; the atmosphere, its relations to man; water, its sources, composition, relations to man, and also methods of storing, purifying, and distributing the same; the soil, its relation to public health, with the uses and methods of drainage; the house as the physical center of the home, and the relations of the family to public health; light in the house; heating and ventilation; the use and abuse of food; brain-work; prevention of disease; diseases resulting from accidents and injuries. The professor of geology has also added largely to the collection of geological and natural history specimens. Considerable additions have been made to the chemical and philosophical apparatus and to the library. There is a standing appropriation of $500 annually, which is applied for the benefit of the latter. No system of manual labor has yet been adopted on the farm, but students are furnished with work, and are paid at the same rate as other laborers employed on the farm. One hundred and one students depend wholly or in part on their labor for support, and 57 have paid their entire expenses during the present year.

Of the 98,119 acres of land actually received by the State from the congressional grant, 29,200 have been sold at an average price of about $5.45 per acre, or $159,140; and the remaining 64,919 acres are valued at $198,000, making a total of $357,140. The entire property of the agricultural and mechanical colleges is valued at $357,250, as follows: Endowment fund, $145,000; 64,919 acres of land unsold, valued at $198,000; college farm, with improvements, $12,000; barn, $1,200; domestic animals, $300; farm implements, $750. The appropriation of $50,000, previously mentioned, was given in common for the university and college buildings, and is not included in this statement.

All students from the State are educated in the agricultural and mechanical colleges without charge for tuition. The number in attendance in the university, including the agricultural and mechanical colleges, during the present collegiate year is 278—206 gentlemen and 72 ladies. All receive instruction in literary and scientific studies and attend the lectures. There are three students pursuing the course of study in the college of the mechanic arts. The college of agriculture has not been brought into full operation since its establishment as a distinct department in 1872.

MISSISSIPPI.

University of Mississippi—College of Agriculture and the Mechanic Arts, at Oxford; Rev. John N. Waddel, D. D., LL. D., chancellor.—This college has five professors and seven adjunct professors, and the university nine professors and eight adjunct professors. Eugene W. Hilgard, Ph. D., has resigned the professorship of agricultural and economical chemistry, and accepted a position in the State Agricultural College of Michigan. The chair of botany and zoology is also vacant. These chairs will be filled at the earliest opportunity with competent profess-

ors. All students belonging to the State are educated without charge for tuition. Sixteen acres of the farm are cultivated with cotton, corn, Hungarian grass, lucerne, and sweet and Irish potatoes. A large number of fruit-trees, adapted to the southern climate, have been set out, embracing apples, pears, peaches, plums, apricots, figs, mulberries, &c.; also an extensive collection of the choicest varieties of the rose, designed for ornament and to cultivate the taste of students in rural art. An additional number of improved agricultural implements will soon be purchased for farm use. Several experiments have been commenced on the farm, but none have been completed. Sufficient manual labor is required of students to make them familiar with the use of all the implements employed on the farm.

The entire property of the college is valued at $93,460, as follows: Two-fifths of 210,000 acres of land, granted by Congress and sold at 90 cents per acre, $75,600, which sum was invested in depreciated Mississippi bonds to the amount of $87,260, on the full face of which interest is paid at 8 per cent.; donation from the trustees of the university, $5,000; college farm, $1,100; farm implements, $100.

The number of students in the university for the present collegiate year is 303; in the college, 5.

Alcorn University—Agricultural and Mechanical College, at Rodney; Rev. Hiram R. Revels, D. D., president.—This university is now fully organized, and has three professors and two instructors. Courses of study have been prepared in agriculture and the mechanic arts, and instruction is given in practical agriculture to forty students; few, however, are sufficiently advanced to enter upon the special courses of study named. This class labored on the farm about four hours daily during the crop season, and did nearly all the work performed on it. The farm contains 250 acres, 56 of which have been cultivated during the year with plowed crops. Fifty were in clover, 3 in sweet potatoes, and 3 in garden. There were raised 750 bushels of corn, 450 of sweet potatoes, some of which were of large size, weighing from 9 to 12¾ pounds each; 500 of turnips, several thousand cabbages, and large quantities of tomatoes, melons, and other crops; also 200 hogs, 25 lambs, and 250 head of poultry. All these animals were slaughtered at the close of the year for use and the market. The orchard contains 500 peach, 100 apple, and 50 pear trees, all of which are represented as growing finely, but none have yet commenced bearing. It is the intention of the superintendent of the farm to put a much larger portion of it under cultivation next year. There are kept on the farm at the present time 6 mules, valued at $1,040; 60 sheep, at $240; and 75 swine, at $375. A barn 50 feet square has been erected, and 15,000 linear feet of plank fence built, 8,500 of which, inclosing the campus, cost $2,500. About $6,000 have been expended in painting and repairing buildings. Experiments have been made on the farm in plowing at depths of 4, 6, 8, and 10 inches, and in all cases the ground which was plowed deepest was productive of the best results. Tuition is free to all students belonging to the State, and in addition to this each county is entitled by law to the education of as many students as it has representatives in the State legislature, on payment of $100 annually to the institution for each student. This includes tuition, board, room-rent, washing, fuel, and lights. Sixty-five students are being educated during the present year from funds derived from this source. The university has the privilege of using, without charge, the library, cabinets, and philosophical apparatus belonging to Oakland College, valued respectively at $7,000, $2,500, and $1,500.

The land, 210,000 acres, granted by Congress to Mississippi was sold for 90 cents per acre, amounting to $189,000. Three-fifths of this sum, $113,400, were given by the State legislature to this university, $10,500 of which were expended in the purchase of land for a farm, &c., and the remainder, $102,900, was invested as a permanent interest-bearing fund in Mississippi State bonds, at a discount, to the amount of $123,150, on which interest at 8 per cent. is paid annually. The university receives yearly from the State $50,000 in State warrants, which are equivalent to about $35,000 in United States currency. The entire property of the Agricultural and Mechanical College is $136,055, as follows: Congressional land-grant, $102,900 invested in Mississippi State bonds, $123,150; congressional land-grant invested in farm, &c., $10,500; farm-stock, $1,655; farm-implements, $750. The property of the university, including all the departments, is $263,055, viz: Agricultural and Mechanical College property, $136,055; college grounds, (50 acres,) $1,500; college edifice, $60,000; 2 society halls, $16,000; 3 brick dormitories, $30,000; 3 farm dormitories, $1,500; president's residence, $6,000; professor's residence, $3,000; 5 cottages, $3,000; boarding-hall, $6,000.

The number of students in the Agricultural and Mechanical College for the present collegiate year is 40; the number in the university is 179.

MISSOURI.

University of the State of Missouri—Agricultural and Mechanical College, at Columbia; Daniel Read, LL. D., president.—Among the improvements made by this college during the present year is the completion of the "Scientific Building," which has been erected by the trustees at an expense of $50,000. It is said to be one of the most complete structures of its kind to be found in the country. There is a basement for furnaces and other laboratory uses. The ground floor contains the general and analytical chemical laboratory, the lecture-room, and the other necessary appurtenances. On the second floor is the lecture-room of the professor of agriculture, with space for botanical, mineralogical, and geological collections. In the third story of the main building are the rooms of the professor of natural philosophy, including those needed for various kinds of apparatus. The hall projecting from the main building in the third story is used for collections in natural history. The apparatus and means of illustration in chemistry and the natural sciences have also been greatly increased, and the library has received important additions of standard works in the various departments of science.

The admission of women into the college forms an interesting and important feature. A class of nineteen young ladies, for the first time, has commenced the course of study in horticulture, which will occupy one year, and may be extended if desired. There are thirteen professors and teachers in the college, and thirty-one in the university, which includes the college and all the other departments. A manual-labor system has been adopted, and students are required to work one hour each day for instruction, but other labor is optional, and those who engage in it are paid at fixed rates.

No report has been received of the present value of the 330,000 acres of land-scrip granted by Congress to the State. The buildings are valued at $75,000; the farm at $60,000; the apparatus at $10,000; the farm-implements at $1,000; and the domestic animals at $500, making a total of $146,500. Two hundred and fifty-seven thousand five hundred acres, or three-fourths of the land-scrip, were given by the State to this college, only a few acres of which have been sold. If this scrip should be esti-

mated at the minimum price of the Government lands, $1.25 per acre, it would amount to $309,375, which being added to the preceding sum would make the value of the entire property $455,875. The land is now leased for a term of years, and yields to the college an annual revenue of $7,500.

All students in the Agricultural and Mechanical College are educated without charge for tuition, an entrance-fee of only $10 being paid at the beginning of each year, and $5 semi-annually for incidentals. The number of students in attendance in the college during the present collegiate year is 138, all of whom are pursuing agricultural studies. The number in the university, including the college, School of Mines and Metallurgy at Rolla, and all the other departments, is 484.

School of Mines and Metallurgy, at Rolla.—According to the declaration of the trustees, this school "is designed, in connection with the Agricultural College of the university, to carry out to its amplest extent the intention of the act of Congress providing for education in the industrial arts. Its curriculum has therefore been arranged with that object in view, and an effort has been made to furnish ample facilities for thorough instruction in the sciences and in their industrial application. It is a school of technology with civil and mining engineering as specialties." As now constituted it has five professors and one lecturer, viz: Charles P. Williams, Ph. D., director and professor of analytical chemistry and metallurgy; James W. Abert, A. M., professor of applied mathematics and drawing; Nelson W. Allen, A. B., professor of pure mathematics; George D. Emerson, M. E., professor of civil and mining engineering; R. W. Douthat, A. M., professor of English branches and German; William E. Glenn, M. D., lecturer on anatomy, physiology, and hygiene. Professors Emerson and Douthat have been added to the faculty during the present year. The chairs of geology and natural history, and of military tactics remain to be filled. No system of manual labor has yet been adopted, but will be as soon as the foundry and work-shop, designed to be connected with the school, are erected. Analyses of Missouri iron and zinc ores and fire-clays have been made, and also investigations into the heating powers and composition of Missouri coals. The room for drawing has been enriched by the purchase of a large number of models, and the facilities for laboratory practice have been increased; additional physical and surveying apparatus has been purchased; the geological, mineralogical, and technical collections have been enlarged by purchase, donations, and field-work consisting of plans and drawings, made and presented by the advanced students. A library of 1,200 volumes, composed principally of standard reference works on physical sciences, mathematics, and technology, has also been purchased. Excursions for field-study of lead and zinc deposits, which abound in the district in which the school is located, will constitute a prominent feature of instruction of the advanced classes.

The Phelps County 10 per cent. bonds amount to $75,000; Missouri 6 per cent. State bonds, to $25,000; 8,000 acres of land, given by Phelps County, are valued at $55,545; apparatus and cabinets, $15,000, making a total of $170,545. Eighty-two thousand five hundred acres, or one-fourth of the land-scrip, were given by the State to this school. If this scrip is estimated at the minimum price of the Government lands, $1.25 per acre, it will amount to $103,125, which being added to the preceding sum will make the entire property $273,670. The land is leased for a term of years, and yields to the school an annual income of $2,500. The

school has no buildings of its own at present. Students are educated on the same terms as in the Agricultural and Mechanical College. The number of students in attendance during the present scholastic year is 75, more than double the number of 1872.

NEBRASKA.

University of Nebraska—College of Agriculture, at Lincoln; Allen R. Benton, LL. D., chancellor.—This university has seven professors, three of whom are employed a part of their time in giving instruction in the College of Agriculture. The classification of the students in the courses of study in the different departments is advancing as rapidly as circumstances will admit, and it is believed that at the beginning of the next collegiate year a perfect classification will be effected. Professor Samuel Aughey, A. M., gives instruction in agricultural chemistry and natural science, and Professor S. R. Thompson, A .M., in theoretical and practical agriculture. A good beginning has been made on the farm. Sufficient progress has not yet been made in the college and on the farm to admit of the adoption of the manual-labor system, but educational and paid labor will be furnished for the students in agriculture at the earliest opportunity. Tuition is free to all students from the State.

None of the 90,000 acres of land granted by Congress for the benefit of the Agricultural College has been sold, and the college has received no donations from individuals except $100 for the purchase of agricultural implements. The entire property of the College of Agriculture is valued at $468,000, as follows: Congressional land-grant 90,000 acres unsold, valued at $5 per acre, $450,000; farm, $15,200; farm-house, $2,000; farm-stock, $425; farm-implements, $375. The property of the university, including all the departments, amounts to $850,800, viz: Land, 44,800 acres unsold, granted by Congress April 19, 1864, for the use and support of the university, and valued at $5 per acre, $224,000; college buildings, $152,000; chemical and philosophical apparatus, $4,000; library, $2,500; cabinet, $300; property of the college of agriculture, $468,000. The chemical and philosophical apparatus, library, and cabinet are held and used in common by the university and College of Agriculture.

The number of students attending the university during the present collegiate year is 92. All are pursuing the literary studies in the university classes, and some at the same time receive instruction in agriculture, but the number is not reported.

NEVADA.

No material change in reference to the establishment of an agricultural and mechanical college in this State has taken place since the last year. None of the land granted by Congress has been sold, and no college has been incorporated. The price fixed upon per acre for the sale of the land is $1.25 in United States currency. Applications have been made to purchase the entire quantity, 90,000 acres, at this price, and it will probably be sold soon, when steps will be taken for the immediate establishment of the college contemplated.

NEW HAMPSHIRE.

Dartmouth College—New Hampshire College of Agriculture and the Mechanic Arts, at Hanover; Rev. Asa D. Smith, D. D., LL. D., president.—There are seven professors and two instructors in the College of Agriculture and the Mechanic Arts, and thirty-three in the parent college.

Important improvements have been made during the year. Two hundred acres of woodland adjoining the farm have been purchased, making the whole number of acres which it now contains 365. A new brick dormitory, to be called Conant Hall, is in course of construction, and is to contain a boarding establishment capable of accommodating 150 students. The new laboratory contains a large lecture-room, four working-rooms, furnace-room, balance-room, and several apparatus-rooms. These rooms are furnished with every appliance for instruction in general, analytical, and agricultural chemistry. Forty new laboratory tables have been built, and are being supplied with water, gas, apparatus, chemicals, and other appliances for the study of practical chemistry. A new and very perfect telescope, with 9.4 inch aperture and 12 feet focal length, by Clark, and an accompanying spectroscope, both of the best quality, have been purchased for the Shattuck Observatory, and a chronograph has been mounted. The museum has been considerably increased by the addition of Ward's restorations of gigantic extinct animals. The class of birds is nearly complete, as represented by the Fairbanks cabinet. The cabinet of minerals contains the State collection of rocks, minerals, and fossils procured by the geological survey of New Hampshire now in progress. Considerable purchases have been made for the astronomical library. The library belonging to the agricultural and mechanical department now contains 1,300 volumes of valuable scientific works. Students have access also to the college library. Twelve scholarships have been established by the State, as derived from the income of the national endowment-fund, covering the tuition of the student, and thirty-eight by Hon. John Conant, each of which yields about $70 annually. The voluntary-labor system has been adopted with the most satisfactory results. More students apply for work than can be accommodated. The price paid per hour for labor is 15 cents. Some experiments have been made to test the value of several commercial fertilizers, the results of which will be given in the annual report of the college, and also in the report of the State Board of Agriculture.

The College of Agriculture and the Mechanic Arts has received in donations from various sources, most of which have been mentioned in our previous reports, $112,000. This property has been so invested by purchases made with incomes saved, and by enhanced value of the real estate, that it now amounts to $160,000. No part of the national endowment-fund has been used for any purpose whatever. The entire property now amounts to $240,000, as follows: Congressional land-grant, 150,000 acres, at 53⅓ cents per acre, $80,000; buildings, $76,000; experimental farm, $30,000; apparatus, $3,000; museum specimens, $6,000; library, $3,000; farm-stock, 26 in number, $2,000; farm-implements, $2,000; 38 scholarships, $38,000.

The number of students in the College of Agriculture and the Mechanic Arts for the present collegiate year is 22; in the parent college, including all the departments, 420.

NEW JERSEY.

Rutgers College—Scientific School, at New Brunswick; Rev. William H. Campbell, D.D., LL.D, president.—Some changes have taken place in the faculty of this school during the present year. Professor David Murray, Ph. D., LL.D., has been appointed by the Japanese government to the position of commissioner of education of that empire, and a temporary leave of absence has been granted him by the trustees of the Scientific School. Professer Charles G. Rockwell, A.M., Ph. D., a graduate of Yale College, and for several years professor in Bowdoin College,

Maine, has accepted an appointment to the chair of natural philosophy and astronomy, and will enter upon the duties of his office in January, 1874. The school now has eleven professors and one tutor; the college, including all the departments, has thirteen professors and one tutor. The new Kirkpatrick Memorial Chapel, the gift of the late Mrs. Sophia Astley Kirkpatrick, referred to in the report for last year, has been completed and was dedicated December 3, 1873. It contains a chapel capable of seating about 500 persons, a library, reading-room, and rooms for the president's private office and recitation-room. Five acres of land which were last year in stumps have been cleared, plowed, and planted, and the whole farm is now without waste land, and ready to be cultivated with any farm-crops. A large number of fertilizers have been analyzed, and their constituents and value ascertained. Dr. George H. Cook, the professor of agriculture, says that the common rotation of grass, corn, oats, wheat, and grass, is not founded on correct principles. These crops all belong to the same natural family of plants, and draw upon the same constituents of the soil, so that it has no rest such as it has when potatoes, beans or peas, turnips and cabbages, or clover, all of which belong to other natural families of plants, are made a part of the rotation. Nineteen head of cattle worth $1,500, and four horses and mules worth $700, are kept on the farm. Of this number twelve are cows of the Ayrshire and short-horn breeds. The milk from these is all sold in town, and averages for each cow during the year 2,699 quarts. In addition to the labor performed in the school and on the farm the professor of agriculture delivers annually at least one lecture in each of the eighteen counties of the State. The object of these lectures is to impart instruction to farmers. They are subsequently published and distributed among the agriculturists of the different counties, with a view to further promote and improve the agriculture of the State.

The entire property of the scientific school is valued at $292,200, as follows: Congressional land-grant, 210,000 acres, at about 55 cents per acre, $116,000; buildings, including the astronomical observatory, $108,000; apparatus and library, $25,000; experimental farm, $40,000; domestic animals, $2,200; farm-implements, $1,000.

No manual-labor system has been adopted, but students visit the farm and receive instruction in its operations. Forty students are entitled by the laws of the State to be educated from the income of the congressional land-grant without charge for tuition, and 38 of this number are now in the school. The number of students attending the scientific school during the present collegiate year is 67, all of whom pursue agricultural or mechanical studies. The number in the college, including all the departments, is 182.

NEW YORK.

Cornell University—Industrial Colleges, at Ithaca; Andrew D. White, LL. D., president.—During the present year Professor I. P. Roberts, of Iowa State Agricultural College, has been called to the professorship of agriculture in this institution in place of Professor Henry McCandless, resigned, and an assistant professor in free-hand drawing has been appointed. An agricultural museum has also been fitted up, in which have been deposited, 1. The collection of cereals of the British Empire; 2. The collection of plow-models, 187 in number, made at the Royal Agricultural College of Hohenheim, in Germany; 3. The collection of models of various implements and agricultural machines received from various sources; 4. The collection of vegetable products of the United States; 5. The collection of foreign implements; 6. The collection of domestic

implements; 7. The collection of engravings of improved stock; 8. The collection of large drawings to illustrate the various lectures on agriculture. The rooms of the veterinary physician have been improved, and rendered more commodious for the display of model specimens and instruments. A model barn has been erected by the liberality of Mr. Cornell for the "special and experimental farm." It has three floors, each accessible to teams from the hill-side on which it is erected. In the basement are the manure-cellar, engine-room, and pig-pens. The middle story, 10 feet high and covering nearly 5,000 square feet, is divided into box feeding-stalls, sheep-pen, horse and cow stalls, calf-pens, and rooms for horse and hand implements, feed-bins, chaff-cutter; and in the hill-side a capacious root-cellar. The upper story, 15 feet high and covering the same area, will be used for storing hay and grain. The barn will be provided with an ample supply of cistern and spring water, with wind-power, and every facility needed for carrying out the experiment of high farming as well as any series of experiments which it may be deemed advisable to undertake. Experiments made in the laboratory are represented as suggesting very important and remunerative improvements in the dairy operations of the State. Work on the farm is provided for such students as desire it, who labor from two to five hours daily. There are kept on the farm five horses, worth $2,865; two oxen, $170; one bull, $100, and ten cows, $400. The farm-implements are valued at $1,200.

In the department of mechanic arts a shop for wood-working has been built, in which steam-power is employed, and carries the machinery of one iron-working shop and a printing-press, all of which is the gratuity of Mr. Cornell. Additional machinery has been placed in the machine-shop, the most important of which is a "shaper," given by Hon. Hiram Sibley, at a cost of $800. Mr. Sibley has this year increased his previous gifts to the College of the Mechanic Arts by the sum of $50,000, making the entire amount of his donations to this department $90,000. By an act of the trustees passed in April, 1872, women are admitted to the university on the same terms as men, except that they must be eighteen years of age. A separate building, called the "Sage College for Women," the gift of Hon. Henry W. Sage, is in process of construction, and will be completed in the spring of 1874. It is 168 feet front, 41 feet wide, and four stories high. Mr. Sage is also erecting at his own expense another building called the "University Chapel," to be used for the usual college chapel-services. It is to be built of brick, will seat 500 persons, and will be completed in the autumn of 1874. The object in view in erecting the Sage College is to give young women an opportunity for the pursuit of the higher studies of the university course.

Of the 990,000 acres of land-scrip granted the State by Congress for the support of an agricultural and mechanical college, 464,000 were sold by the State of New York or by Ezra Cornell, without entering upon the land, for $428,756.80, at an average price of about 92 cents per acre, as follows: Scrip, 76,000 acres, at 85 cents, $64,600; 100,000 at 90 cents, $90,000; 180,000 at $1, $180,000; 101,920 at 86 cents, $87,651.20; 6,080 at $1.07, $6,505.60. The scrip for the remaining 526,000 acres has been located by Ezra Cornell for the benefit of the university, and a contract has been made for the sale of 100,000 acres at $4 per acre, amounting to $400,000; and of 12,000 acres at $5.70 per acre, amounting to $68,400. The whole number of acres sold and contracted to be sold is 576,000 for $897,156.80, and the average price of the whole per acre is about $1.56. The number of acres remaining unsold is 414,000.

The entire property of the university, including all the departments or colleges, is estimated at $3,627,200.48, as follows: Land unsold, 414,000

acres, valued at about \$3.62½ per acre, \$1,500,000; college land-scrip fund, \$473,402.87; Cornell endowment-fund, \$128,596.61; Mr. Cornells' endowment-fund, \$500,000; private donations expended for buildings, \$423,000; buildings erected by the university, but not from the income of the national funds, \$175,000; university farm and grounds donated, \$96,701; Henry W. Sage endowment, \$100,000; Dean Sage endowment, \$30,000; Hiram Sibley endowment, \$50,000; library, \$60,000; scientific collections, \$40,000; Horace K. White, veterinary-prize fund, \$500; machinery, apparatus, furniture, equipments, &c., \$50,000. Of this amount the proportion peculiarly applicable to the agricultural and mechanical colleges, derived from the congressional land-grant and donations made with special reference to these colleges, is \$2,651,998. The part derived from the congressional land-grant is \$1,973,403; from individual donations, \$678,595. The donations from individuals to the university, including all the departments or colleges, exceed \$1,500,000.

The library contains 37,000 volumes, and is composed of the following books and private libraries, which have been purchased by the university or given to it: 1. A selection of 5,000 volumes on agriculture, purchased in Europe; 2. A part of President White's library, 4,000 volumes on history, &c.; 3. The Anthon library, 7,000 volumes, on ancient languages, collected by Professor Charles Anthon, late of Columbia College; 4. The Bopp library, 2,500 volumes on the oriental languages, collected by Franz Bopp, of Berlin; 5. The Goldwin Smith library, 3,500 volumes on history, presented by Professor Goldwin Smith; 6. The publications of the patent-office of Great Britain, 2,500 volumes relating to technology, &c.; 7. The White architectural library, 1,000 volumes on architecture, presented by President White; 8. The Kelly mathematical library, 1,800 volumes and 700 tracts, presented by the late Hon. William Kelly, of Rhinebeck; 9. The Cornell agricultural library, given by Hon. Ezra Cornell; 10. The Sparks library, 5,000 volumes and 4,000 pamphlets on American history, collected by Jared Sparks, the historian; 11. The May collection on the history of slavery and anti-slavery.

By law tuition is free to 512 students in the State, and povison has been made by the trustees for 40 more free scholarships to be given to students of special merit. The number of students in attendance in the university for the collegiate year 1873 is 461, 151 of whom attend to agricultural and mechanical studies. All students before they graduate in any department are required to attend the courses of lectures on agriculture, usually 18 in number.

NORTH CAROLINA.

University of North Carolina—College of Agriculture and the Mechanic Arts, at Chapel Hill; Rev. Solomon Pool, D. D., president.—In the catalogue of this university for 1869-'70 the president, in his remarks on the College of Agriculture and the Mechanic Arts, says: "This college is not yet fully organized. The professor of agriculture will give instruction in his department, and also in chemistry and natural history." The university was closed the next year, (1871,) and, in consequence, the College of Agriculture and the Mechanic Arts. One of the amendments to the State constitution, recently adopted, gives the general assembly authority to provide for the election of trustees, and makes provision for re-opening the university, which is still closed. The general assembly is now in session, (December 12, 1873,) but no action has yet been taken in reference to the subject, and the probability is that nothing will be accomplished during the present session. In the act of incorporation of the college and transfer of the land-scrip to the university, provision

was made by the general assembly for the education of thirty students, one to be selected from each county annually, without charge for tuition or room-rent. The congressional land-grant was sold at 50 cents per acre, and amounted to $135,000. The Department has not received any report of the value of the property of the college.

OHIO.

Ohio Agricultural and Mechanical College, at Columbus; Edward Orton, A. M., president.—This college was opened for the reception of students September 17, 1873. It has five professors besides the president, who is professor of geology, and one assistant professor, as follows: T. C. Mendenhall, B. S., professor of physics and mechanics; Sidney A. Norton, A. M., M. D., of general and applied chemistry; Rev. Joseph K. Millikin, A. M., of the English language and literature, and of the French and German languages; Norton S. Townshend, M. D., of agriculture; R. W. McFarland, A. M., of mathematics and civil engineering, and instructor in military tactics; John Henry Wright, A. B., assistant professor of the Latin and Greek languages. The curriculum of study embraces: 1. Geology and paleontology; 2. Physics; 3. General and applied chemistry; 4. English language and literature, and French and German languages; 5. Agriculture; 6. Mathematics and civil engineering; 7. Latin and Greek languages. A special course of study is arranged for each of these departments. The course in agriculture, which occupies three years embraces:

Agriculture, its purpose, scope, and history; the farm and its arrangement; soils, their composition and adaptations; field-crops, tillage, fertilizers, pastures, and meadows; draining, irrigation, roads, buildings, fences, hedges, and forests; fruit-growing; the dairy and its products; wool and sheep husbandry; domestic animals, their anatomy, physiology, and general arrangement; diseases of animals, medical and surgical treatment; pests of the farm; markets and transportation; and financial results of agriculture.

It will also embrace various additional branches included in the other departments. Full freedom is granted to the student to select the branches which he desires to pursue. On completion of the studies of any department the student will receive a certificate of the fact, and the diploma of the college on the completion of a specified number of these courses. Sufficient time, since the opening of the college, has not elapsed for perfecting a definite system of manual labor. Students will, however, have an opportunity of working on the farm, under the direction of the professor of agriculture, on such terms as will be deemed most advisable. Some now attending the college are defraying a large portion of their expenses by their labor. Provision has been made for 204 students, or two for every member of the House of Representatives, who will be educated without charge for tuition. Others will be required to pay $8 per term, or $24 per year. No additional charges will be made except for chemicals used in the laboratory.

An engraving of the college building was given in the report of the Department for 1871. It is a fine brick edifice, three stories high, not including the basement and attic, and finished with stone-dressings above the basement, which is entirely of stone. Including the projections of the buttresses it has a front of 235 feet, and will accommodate 500 to 800 students. It is composed of a central building having two connecting and two terminal wings. The central building is 67 feet front, 109 deep, and 58 feet 3 inches in height. The main tower has a base 21 feet 6 inches square,

and a height of 104 feet to the top of the crown. The central building is flanked by two connecting wings, which are 41 feet front by 58 deep, and 54 feet 9 inches high. On the main floor of the front portion of the central wing are the office and reception room, the college library room, and the complemental apartments. The upper stories of this portion of the central building are to be occupied by recitation and professors' rooms. The rear contains two large amphitheaters, 51 by 67 feet, occupying the entire height of the principal stories. In the attic portion of the building are two society halls, so arranged as to be used conjointly for one large hall when desired. The connecting wings, besides the complemental apartments, contain professors' rooms in all their principal stories. The terminal wings have no divisions above the basement, the rooms being the entire size of the wings. They are to be used for recitation and work rooms. The apartments of the basement not required for heating are designed to be used for purposes similar to those of the terminal wings.

The college has received in donations, exclusive of the congressional land-grant, $388,000, namely, $300,000 from Franklin County, $28,000 from private contributions, and, from the State, land valued at $60,000. The proceeds ($342,451) of the congressional land-grant, with interest, amount to $504,000. Add to this the value of apparatus, cabinets, and other items not mentioned, and the entire property of the college, as estimated by the trustees, amounts to $904,000.

The physical and chemical laboratories will be equipped with the most approved modern apparatus, and opened to students for daily laboratory work January 6, 1874. The other departments of engineering, zoölogy, botany, &c., will be furnished with the necessary illustrative apparatus at an early date. The geological hall now contains a very extensive collection of minerals made by the State geological survey.

The number of students in attendance during the year 1873 is 35, 18 of whom are attending to mechanical studies.

OREGON.

Corvallis College—State Agricultural College of Oregon, at Corvallis; B. L. Arnold, A. M., president.—During the present year the course of study in this college has been enlarged, and the faculty increased both in number and efficiency. There are now three professors, one instructor in military tactics, and two teachers. The college educates 44 students for the State, without charge for tuition, instead of 60, the number for the previous year. A manual-labor system has been adopted, and students are now required to work one hour daily on the farm.

None of the land granted by Congress has been sold. It is valued at $2.50 per acre, at which price the proceeds would amount to $225,000. It has received from the citizens of Benton County a farm of 160 acres, worth $5,000, from private sources $2,000, and from the State an annual appropriation of $5,000 since 1868, which has been expended in defraying the salaries of teachers. The college buildings are valued at $6,000, and the philosophical and chemical apparatus at $1,000. The entire property of the college is $239,000.

The number of students in attendance during the collegiate year is 125, 50 of whom are attending to agricultural and mechanical studies.

PENNSYLVANIA.

Agricultural College of Pennsylvania, Centre County; Rev. James Calder, D. D., president.—The college year now begins in August, instead of

February, as formerly. The campus in front of the main college building has been cleared off and graded, and shade-trees and evergreens set out. The college building has also been improved both in respect to light and heating. The farms have been greatly improved by removing stones and leveling the surface. A large number of strawberry-plants and fruit-trees have been set out, and arrangements have been made for establishing a specimen fruit-garden of about four acres, with the double object of fruit production and of affording pleasant and useful employment for students of both sexes. Important changes and improvements have been made in the roads leading from the turnpike to the college buildings, and the township road has been so located as to pass between the central experimental and the college farms, by which several important advantages are secured. The usual number of elaborate experiments have been conducted on the experimental farms, but the results have not yet been reported. The manual-labor system of ten hours a week is continued as in former years, and operates well.

Twenty-five young ladies are now pursuing the studies of the college with satisfactory results. Tuition is free to all students, the number not being limited. The annual income from the permanent fund is now about $30,000, but so large are the drafts on this for carrying on the three experimental farms that the faculty, consisting of seven professors, including the president, and three assistants, receive only $11,300 for their ervices during the year.

The land, 780,000 acres, granted to this college by Congress, was sold for about 56 cents per acre, amounting to $439,186.80. Of this sum $43,886.50 were expended for the purchase of model and experimental farms, leaving $395,300.30 as a permanent productive fund for the support of the college. In 1872 the State, by an appropriation of $104,699.70, increased this fund to $500,000, and gave a new bond at 6 per cent. annually, covering the entire amount of the productive fund thus increased. The State had previously made appropriations to the college to the amount of $99,900; the citizens of different counties of the State and other individuals have donated $69,000; the stock kept on the farms is valued at $8,487, and the farm implements at $6,816. These contributions have been so judiciously managed and increased that the entire property of the college is now valued at $897,589, as follows: Productive-endowment fund, $500,000; college buildings, $300,000; college farm, 300 acres, at $90 per acre, $27,000; central experimental farm, 100 acres, $9,000; eastern farm, 100 acres, $20,000; western farm, 121 acres, $18,136; stock on college farm, $3,787; farm implements, $1,977; stock on central farm, $1,285; implements, $1,906; stock on western farm, $950; implements, $1,550; stock on eastern farm, $2,465; implements, $1,383; college library, $3,500; apparatus, $4,000; mineralogical cabinet, $650.

The number of students in attendance during the current year is 155, being an increase of 5 over the last year.

RHODE ISLAND.

Brown University—Agricultural and Scientific Department, at Providence; Rev. E. G. Robinson, D. D., LL. D., president.—Important improvements have been made during the present year in the museum of natural history. Ten new cases, of fine model and finish, have been constructed for its use at an expense of $1,000; and during the last two years 25,000 specimens have been collected, and are now being arranged and labeled. Fifteen thousand specimens, many of them rare, have been secured by

exchange of duplicates in ornithology with Professor Agassiz, and will soon be transferred to the museum; also a very valuable donation of almost all the fresh-water and marine shells of Rhode Island has been made by Mr. Horace Carpenter. The curator of the museum, Professor J. W. P. Jenks, A. M., remarks that unsolicited contributions flow in faster than they can be arranged and labeled, although he has devoted a large part of his own time to the labor, and received much gratuitous assistance from the students. It is his intention to make the museum so extensive that it shall contain specimens to illustrate every branch taught in the institution. As "lecturer on special branches of agriculture" he has given courses of lectures on agricultural subjects to the senior class during the present year, in which he has made free use of the specimens necessary for illustration, and found them indispensable to thorough teaching. Two hundred and forty dollars have been expended for new and improved acoustic apparatus, purchased of the celebrated establishment of Koenig, in Paris, and $25 for models, microscropic specimens, and diagrams illustrative of the eye, ear, articulations of the hands, &c.

Thirty-three students are entitled to be educated by the university without charge for tuition. They may take the full course of four years pursued in the university, the partial scientific course of three years, or the partial course, as they choose. In the practical and scientific course and in the partial course special provision is made for the study of agriculture and the mechanic arts. By the act of the legislature transferring the proceeds of the congressional land-grant to the university that institution is required "to provide a college or department in said university, the leading object whereof shall be, without excluding other scientific and classic studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts." In order to carry out this requirement in its spirit and to its fullest extent the president suggests that certain changes be made in the courses of study, by which more attention may be paid to the branches relating to agriculture, as geology, physiology, zoölogy, botany, &c.; and also that the mechanical studies be so extended as to impart full and thorough instruction in design, drawing, civil engineering, architecture, and the fine arts generally. He is of opinion that the progress of science and invention, and also the agricultural and manufacturing interests of the State, demand these changes, and it is inferred that future improvements will be made with special reference to these objects.

The entire property of the Scientific and Agricultural Department is valued at $56,000, as follows: Congressional land-grant, 120,000 acres, at 41⅔ cents per acre, $50,000; interest accrued, $6,000. No donations from the State or individuals have been made especially for this department. This department has 10 professors and 3 instructors. The number of students in attendance during the present year is 25; in the university, including all the departments, 218.

SOUTH CAROLINA.

Claflin University—South Carolina Agricultural College and Mechanics' Institute, at Orangeburgh; Rev. A. Webster, D.D., president.—This university has four professors and two assistants. Some embarrassments in the operations of the agricultural college have been experienced during the year. The bonds representing the proceeds of the congressional land-scrip have not yet been transferred to the trustees. The legislature of the State last year appropriated $11,508 to pay the interest which had accrued on

the bonds, but only one-third ($3,830) of this sum has been paid, $2,000 of which the trustees used in part payment for the experimental farm, which they had previously purchased for $9,000, and the remainder was devoted to current expenses. Some improvements have been made, under the direction of the president of the university, on the experimental farm, and a few crops have been cultivated. Tuition is free to all.

According to the act of incorporation of the Agricultural College and Mechanics' Institute "the course of instruction shall include the English language and literature, mathematics, civil, mechanical, and military engineering, agricultural chemistry, mineralogy, animal and vegetable anatomy and physiology, veterinary art, entomology, geology, political, rural, and household economy, horticulture, moral and mental philosophy, history, book-keeping, military training and tactics, and especially the application of science and the mechanic arts to practical agriculture in the field." An effort will be made during the present session of the legislature, which commenced in November, to effect a transfer of the bonds, and to provide for the payment of the interest promptly as it becomes due. The land, 180,000 acres, granted by Congress was sold for 72½ cents per acre, and the proceeds invested in South Carolina State bonds purchased at a discount and amounting to $191,800. The college has received no private donations and has no buildings of its own, but the students will occupy those of the university in common with the other departments. The entire property of the college is valued at $200,800, as follows: Proceeds of congressional land-grant ($130,500) invested in State bonds, $191,800; experimental farm, paid for in part, $9,000.

The number of students attending the university during the present collegiate year is 97, 17 of whom are in the classical department, 34 in the normal, and 46 in the preparatory.

TENNESSEE.

East Tennessee University—Tennessee Agricultural College, at Knoxville; Rev. Thomas W. Humes, S. T. D., president.—Two departments have thus far been organized in this university: 1. The collegiate department or agricultural college, which comprises three courses of study—the agricultural, the mechanical, and the classical, each of which occupies four years. 2. The preparatory department, which has two courses of study, each occupying three years—one for preparing students for the agricultural and mechanical courses, and the other for the classical course. The collegiate department has eight professors and three instructors, and the preparatory has a principal and four assistants.

During the present year a brick boarding-house, of large dimensions, has been erected on the college grounds. It contains a spacious dining-room for students and a large number of lodging-rooms, besides accommodations for the steward and his family. A neat cottage for the farm superintendent and a commodious barn adjacent to it have also been built on the farm. The usual amount of farming labor has been performed. Although no compulsory labor is required, yet a manual-labor system has been adopted, and such students as desire to work have labor assigned them on the farm, and are remunerated for it. Four mules, valued at $600, and one Devon bull, at $90, are kept on the farm. The farm-implements are valued at $500. The entire property of the Agricultural College amounts to $397,190, as follows: Tennessee bonds, $396,000, purchased at a discount, with the proceeds of the congressional land-grant, which amounted to $271,875, the scrip having been sold at about 90 cents per acre; farm-stock and implements, $1,190.

The property of the university, including that of the Agricultural College, is valued at $527,190. The buildings and land, worth $130,000, belong to the university.

The number of students attending the university during the collegiate year is 271; in the Agricultural and Mechanical College 64, 37 of whom pursue agricultural and mechanical studies; and in the preparatory department 207. The number in the university includes the students in all the departments.

TEXAS.

Agricultural and Mechanical College of Texas, at Bryan.—Little progress has been made by this college since the last year, 1872. The college building is only partly completed, but the work is advancing under a competent and faithful supervisor, and it is expected that it will be finished soon. The cause of this slow progress is the want of the necessary appropriations from the State. The entire property of the college is valued at $291,240, as follows: Congressional land-grant, 180,000, acres at 87 cents per acre, $156,600, which sum was invested in Texas frontier-defense bonds to the amount of $174,000, the bonds being purchased at 90 cents on a dollar; interest accrued on this fund, $30,240; donation of $12,000 in bonds from Brazos County, in which the college is located; appropriation of $75,000 by the State for the erection of the college buildings and the purchase of 800 acres of land for the site of the buildings and for the experimental farm. Of this sum $12,000 have been expended for the purchase of the land, and the remainder for the erection of the buildings.

VERMONT.

University of Vermont and State Agricultural College, at Burlington; Matthew H. Buckham, A. M., president.—No important changes have been made in this institution during the present year. There are six professors engaged in giving instruction in branches relating to agriculture and the mechanic arts, and in all the departments of the institution fifteen professors and instructors are employed. The Agricultural College fund is devoted to the maintenance of scientific courses, branching after the first year into the departments of civil engineering, mining engineering, and agricultural and general chemistry. The labratory has been fitted up with conveniences for manipulation and experiment, and offers great advantages to those who desire to pursue a course of practical chemistry under the supervision of the professor of that department. Special attention is also given to the assaying of minerals and furnace-products, and to the investigation of their character and value.

Fifteen scholarships, canceling tuition, which have been established in the institution by private donations, are at the disposal of the faculty, and are awarded to needy and deserving young men. All other students pay $45 each for tuition for the collegiate year. A prize of $30 is awarded to the candidate passing the best examination for admission, and one of $20 to the second best in both the academic and the scientific department.

By an act of the State legislature for the transfer of the congressional land-scrip to the University of Vermont for the support of an agricultural college, the university and college were incorporated as one institution, called the "University of Vermont and State Agricultural College." Since the transfer of the scrip the institution has received from the alumni of the university, and other individuals, donations amounting to $85,753 in money, besides books and contributions to cabinets,

valued at $1,500. Of these donations $29,250 have been added to the permanent productive fund; $25,000 have been employed for the endowment of a professorship; $5,763 for the erection of an art gallery, and the remainder for other purposes connected with the permanent property of the institution. The entire property of the University of Vermont and State Agricultural College is valued at $416,972, as follows: Lands, $127,900; buildings, $64,000; chemical and philosophical apparatus, $5,400; library, $35,000; cabinets, $10,000; furniture, $2,000; bonds, $37,172; congressional land-scrip, 150,000 acres, at about 82 cents per acre, $122,626; interest accrued on proceeds of land-scrip, $12,874.

The number of students attending the institution during this collegiate year is 71; in the agricultural and mechanical department, 21.

VIRGINIA.

Virginia Agricultural and Mechanical College, at Blacksburgh; Charles L. C. Minor, M. A., president.—Improvements, involving considerable expense, have been made by this college, during the present year, in remodeling and repairing buildings and in improving the farm. One thousand five hundred dollars have been expended for apparatus and books, and $1,148 for stock and farm equipments. Two donations have also been received—$1,100 from General J. R. Anderson, of Richmond, and $1,000 from John T. Cowan, esq., of Montgomery. Provision has been made for three departments of instruction: 1. The literary department, embracing the English language and literature, the ancient languages, the modern languages, and moral philosophy. 2. The scientific department, embracing mathematics, natural philosophy, chemistry, mineralogy, geology, botany, and zoölogy. 3. The technical department, embracing agriculture and mechanics. All the students during the present collegiate year, which is the first of the college, have pursued the same course of study, but hereafter they will take separate courses in the different departments to which they may be assigned. Two courses of lectures will be delivered on agriculture to the senior class. The first course will embrace three lectures a week, and the second two. The lectures will include farm-animals, soils, plants, landscape gardening, floriculture, arboriculture, construction of walks and roads, rotation of crops, management of labor, methods of experimenting, general farm economics, farm records and accounts, building materials, masonry, framing, strength of materials, rural architecture, construction of farm buildings, bridges, gates, fences, farm-implements and machinery, production and preparation of food, tanning, and soap-making.

Manual labor on the farm or in the workshops is made compulsory only so far as is necessary for thorough instruction of the students in their studies, and will not exceed two hours daily. None are excused from this labor except such as are physically disabled. Regular details of students were made every day during the crop season, with satisfactory results. A large majority of those who had been accustomed to labor did excellent work on the farm and in the garden, and for extra labor not required for instruction received a liberal compensation. Such compensated labor was eagerly sought by many of the students. A few, by severe economy and hard work, were able to pay nearly all their expenses and to maintain a good standing in their classes. Students to the number of 132 are to be educated without charge for tuition or room-rent, a fee of only $5 being required as a deposit to defray expenses for damages which may be done to college

property. If any balance is left it is returned to the student at the end of the year. The expenses of one of these students for a year, including a uniform worth $17.25, need not exceed $150. Other students will be required to pay $45 in addition.

The entire property of the college is valued at $225,000. One hundred and ninety thousand dollars of this sum were derived from the sale of two-thirds of the 300,000 acres of land-scrip granted to the State by Congress, and sold at 95 cents per acre; the domestic animals are valued at $2,500; the farm-implements at $1,500; Montgomery County and individuals gave the remainder.

The president in his report for the present year, speaking of the advantages and future prospects of the college, says: "If, however, its organization and management be so ordered as to make it an efficient training-place for practical farmers and mechanics, from which they shall go forth men able and willing and proud to break up the great plantations into small farms; to plant orchards and tend them; to rebuild the houses, barns, and stables; to make the roads and bridges; to build and work furnaces and factories, and open mines, it will not only supply that which all consider to be our greatest want, skilled labor, but will soon have for its grateful and loving alumni the thriftiest, the richest, the most honored men in every community of the State."

The college has six professors. The number of students in attendance during the present collegiate year is 132.

Hampton Normal and Agricultural Institute, at Hampton; General Samuel C. Armstrong, president.—This institution is the result of the private enterprise and liberality of benevolent persons in different sections of the United States, and was established with special "regard to the wants of the colored race." In the act of the original incorporation, September 21, 1868, its object is represented to be "for the instruction of youth in the various common-school, academic, and collegiate branches, the best method of teaching the same, and the best mode of practical industry in its application to agriculture and the mechanic arts." Immediately after the passage of the act by the general assembly of Virginia, March 19, 1872, and appropriating to the income from one-third ($95,000) of the proceeds of the land-scrip accruing to Virginia under the act of Congress of July 2, 1862, making this institute a State agricultural college, the trustees of the institute adopted, among others, the following resolution: "That in view of this appropriation the trustees hereby stipulate to establish at once a department in which thorough instruction shall be given by carefully selected professors in the following branches, viz: Practical farming and principles of farming; practical mechanics and principles of mechanics; chemistry, with special reference to agriculture; mechanical drawing and book-keeping; military tactics." The trustees at the present time are George Whipple, New York, president; R. W. Hughes, Virginia, and Alexander Hyde, Massachusetts, vice-presidents; S. C. Armstrong, Virginia, secretary; J. F. B. Marshall, Boston, treasurer; T. K. Fessenden, Connecticut, financial secretary; O. O. Howard, United States Army, Washington; M. E. Strieby, New York; James A. Garfield, M. C., Ohio; E. P. Smith, Minnesota; John F. Lewis, United States Senator, Virginia; B. G. Northrop, secretary Connecticut State Board of Education, New Haven; Samuel Holmes, New York; Anthony M. Kimber, Philadelphia; Edgar Ketchum, New York; E. M. Cravath, Brooklyn, New York.

Although the institute is designed to instruct the colored people in all the branches of a general education, and to train teachers for the colored schools in different parts of the State, yet it is distinctly agricul-

tural, and is claimed to be in advance of any other in the United States which is devoted to the improvement of the colored race. The course of study embraces three years. All the male students (126) receive instruction in agriculture. They are divided into five squads, each squad working one day of ten hours each week; and all work at least half a day on Saturday. Every student, therefore, labors one day and a half each week on the farm, for which he is paid 7 to 10 cents per hour according to his ability. Employment is furnished for those who desire to labor during the long vacation of three and a half months, thus enabling them to pay for their board, books, and $20 to $25 worth of clothing, which is furnished at very low prices, being manufactured by the industrial school connected with the institute. A market-wagon is run daily, supplying customers at Old Point Comfort with fresh milk and vegetables from the farm. A meat-cart runs three times a week to Hampton and Old Point Comfort. Peaches, potatoes, and cabbages are shipped to Baltimore, Philadelphia, New York, and Boston with unusually satisfactory returns. There are kept on the farm this year 18 cows, 1 Ayrshire bull, 9 calves, 5 horses, 5 colts, and 4 mules. The peach-orchard contains 800 trees, the apple 500, pear 500, cherry 300, quince 100, and the plum 50.

A job printing-office is connected with the institute, in which several students are taught, by a competent printer, the art of printing, and are enabled in this way to pay a portion of their expenses in the school. Messrs. R. H. Hoe & Co., of New York, have given the office a hand stop-cylinder printing-press of the most approved pattern, valued at $2,250. During the first eight months of the operations of the office the receipts for job printing amounted to $1,784.45, and exceeded the expenses, including the wages of the foreman and assistants, by $75.85, besides affording several students an opportunity of learning a useful trade. The female students are taught in the industrial school in sewing and the manufacture of articles of clothing, which are sold to the students and in the market. Thirty-one young women have been employed a part of the time on this work, by which they have defrayed a portion of the expenses of their education. In estimating the good results of the manual-labor system the president says: "As the highest possible tribute to the value of the manual-labor system, as practiced at the Hampton Institute, the heads of the departments bear unanimous witness to the marked progress from month to month of the students employed under their direction."

Among the improvements of the present year is a large brick building in process of erection, to be called "Virginia Hall," and to contain dormitories for 120 girls, a dining-hall for 250 students, an industrial room for girls, a chapel, kitchen, laundry, printing-office, and workshop. It is estimated to cost $75,000 to $100,000. The walls are now up, (December 6, 1873,) and the roof is going on. Thirty-one male students are camping out in tents for the winter, in consequence of a want of rooms for their accommodation. After the completion of this hall it is contemplated to build a model barn for the accommodation of the farm.

The original property of the institute, consisting of 160 acres of land, the "Mansion House," the brick walls of an old mill, and some hospital barracks, was purchased by the American Missionary Association in June, 1867. Nineteen thousand dollars were paid for the land, $10,000 of which were received from the trustees of the Avery fund, a large bequest left by Mr. Charles Avery, of Pittsburgh, Pa., for the education of freedmen in the United States and Canada. A donation of $6,000 from Mrs. Griggs, of New York, (afterward increased to $10,000,) furnished

the means for fitting up the old mill for the residence of the matron of the institute and for dormitories for girls. This building is now called "Griggs Hall." The college building, called "Academic Hall," was erected of brick in 1870, at an expense of $48,500, and contains the class rooms, office, library, and other rooms necessary for conducting the school.

The institute has received since its organization, in private donations, $206,159; in interest on the agricultural college fund, (congressional land-grant,) $7,480; and from the Bureau of Refugees, Freedmen, and Abandoned Lands, $58,328, making a total of $271,967. A part of this sum has been devoted to the payment of the current expenses of the institution, and the remainder to the purchase of the property named above. Of the private donations previously mentioned, $55,978 have been received from the American Missionary Association and societies contributing through it; $34,000 from the trustees of the Peabody fund; $10,971 from "Hampton Students" (vocalists;) $4,000 from the trustees of the Homer Treat fund; $5,000 from the executors of the estate of George Laws; and the remainder from individuals and interest on the private endowment-fund. Very liberal donations have been made by a large number of gentlemen and ladies in the different States, among whom the following may be named: In Connecticut: Mr. Roland Mather, $1,500; Mr. Frederick Marquand, $1,041; Mr. Aaron Benedict, Mr. John B. Eldridge, Mr. R. S. Ely, Mr. Charles Thompson, Mrs. B. W. Carter, and Miss Eliza Butler, $1,000 each. In New York: Mr. J. S. Schultz, $1,537; Mr. R. R. Graves, and Mrs. S. P. Maghee, $1,000 each. In Massachusetts: Mrs. Ichabod Washburn, $2,000; Mrs. E. W. Fletcher, $1,000; the Messrs. Whiten Brothers, of Whitensville, $1,000. In New Jersey: Mr. J. B. Beadle, $1,200. In Rhode Island: Mr. Henry J. Steer and Mrs. Ann Richmond, $1,000 each.

The expenses of the institute for the present year are about $30,000, $2,000 of which have been derived from the interest on the private endowment-fund; $8,000 from the congressional land-grant fund; $2,000 from cash payments by students; $10,000 from donations unrestricted as to expenditure; and $8,000 from scholarships not guaranteed. The last two sources of income are uncertain and dependent on personal solicitation of the principal and other friends of the institute. For several years, therefore, more than one-half of the funds necessary for the support of the school must be obtained from voluntary contribution.

The entire property of the institute is under the control of the board of trustees, and at the present time amounts to $266,448, as follows: One-third of the land-scrip granted by Congress to the State, 100,000 acres at 95 cents per acre, $95,000; private endowment-fund, $38,830; experimental farm, $25,000; institute premises, 10 acres, $5,000; buildings, $83,953; farm-stock, $3,466; farm-implements, $1,533; apparatus, $1,040; furniture, $7,726; printing-office, presses, type, &c., $4,900.

The number of State students entitled by law to be educated without charge for tuition by the agricultural department of the institute is 100, but not one-third of that number can at present be received. All students are now admitted free of tuition and room-rent. Expenses for board, washing, and lights are $10 per month. The number of students in attendance during the present collegiate year is 215, 126 males and 89 females.

WEST VIRGINIA.

West Virginia University—Agricultural Department, at Morgantown; Rev. Alexander Martin, D. D., president.—This university, by the act of

incorporation and transfer of the congressional land-grant, February 7, 1867, was called simply the "Agricultural College;" but by an act of State legislature the name was subsequently changed to the "West Virginia University," with a department of agriculture. It has eight professors, six assistants, and two lecturers. Five of these professors and three assistants give instruction in the agricultural department. The course of study in the agricultural department occupies two years, and in the literary, scientific, and engineering departments four years. The students in the university are distributed in the different courses as follows: Thirty-three in the literary course, 14 in the scientific, 15 in the optional, and 82 in the preparatory. The optional course is designed for those students whose special tastes or necessities prevent them from graduating in any of the regular departments. They receive certificates of their attainments on leaving the university. There is a volunteer labor-corps of 29 students connected with the agricultural department, who receive instruction in agriculture. Of this corps the president says: "Several of our young men have found it pleasant and healthful to spend an hour or two a day, at a remunerative price, in improving and ornamenting the grounds, under the direction of the superintendent. The corps also forms the nucleus of a class in practical and scientific farming and related studies." The compensation received is 12 to 15 cents per hour. Courses of lectures are given regularly on agricultural subjects during each term of the agricultural course.

The principal buildings are the "University Hall," the "Armory Hall," and the "New Hall." The university hall was erected at a cost of $60,000, and is used for general purposes of instruction, laboratory, &c. The Armory Hall, referred to in the report of the Department for last year, has been completed at a cost of $3,500, and is used for the storing and safe-keeping of the United States and State arms, and as the headquarters of State students who receive their education without charge for tuition. There are 36 students who receive instruction in military tactics. The central portion of the New Hall, for which an appropriation was made by the legislature at its last session, has been put under contract to be built for $43,000, and is now in course of construction. It is designed for the general purposes of the university. During the present year fifty volumes of standard works, including a most valuable and complete copy of the Natural History of New York, have been purchased and added to the library, which now contains about 4,000 carefully selected volumes. Among the important apparatus which has been recently procured may be mentioned a Smithsonian barometer, a sextant by Crichton, of London, a clock with zinc compensation by E. Howard & Co., of Boston, and a seven-foot telescope by John Byrne, of New York. The museum has received large accessions, and contains over 2,000 specimens of minerals and fossils, and more than 2,300 recent shells.

The university has received considerable sums at different times in appropriations and donations, in which the agricultural department has shared in common. The citizens of Morgantown donated in buildings, grounds, and money $50,380; the State legislature appropriates a sum which, on an average, has thus far amounted to $17,380 yearly, a part of which has gone to defray current expenses, part to the building fund, and part to the permanent endowment. The Peabody educational fund has furnished $500 a year to aid students who are qualifying themselves for teachers in West Virginia, or any other State entitled to the advantages of this fund. The entire property of the university, including all the departments, is valued at $200,000, as follows: Congressional land-grant, 150,000 acres, at 60 cents per acre, $90,000; build-

ings and grounds, $85,000; apparatus and cabinets, $5,000; appropriations by the legislature to the permanent productive-fund, $20,000. The property of the agricultural department, as distinct from the university, may be valued at $155,000, $90,000 being derived from the congressional land-grant, $20,000 from State appropriations, and $45,000 from one-half of an undivided interest in the buildings, apparatus, and cabinets of the university, which are used in common, and are valued at $90,000.

Thirty-six students are entitled by the law of the State to be educated in the agricultural department without charge for tuition. The number of students attending the university during the present collegiate year is 144, 29 of whom receive instruction in agriculture.

WISCONSIN.

University of Wisconsin—College of Arts, at Madison; Rev. J. H. Twombly, D. D., president.—This university has seventeen professors, three instructors, and six teachers. The College of Arts includes the departments of agriculture, engineering, mining and metallurgy, and military science, and has nine professors.

An annual appropriation has been made by the State for supplying apparatus for experiment and analysis in the department of chemistry and physics, and the advantages for acquiring a knowledge of branches belonging to this department are ample. Important improvements have also been made during the present year in facilities for the assaying of metals and ores, and they are believed to be as great as in any other institution in the West. The geological and mineralogical cabinet has been re-arranged and greatly improved. The College of Arts received a donation of $40,000 from Dane County, which sum was expended in the purchase of an experimental farm. The trustees have sold 183,676 acres of the congressional land-grant at an average price of $1.25 per acre, amounting to $229,595. The 56,324 acres remaining unsold are valued at $1.25 per acre, and amount to $70,405, making a total received from the United States of $300,000. The entire property of the college, as computed by the secretary, is valued at $359,204, as follows: Productive fund, (invested,) $225,310; experimental farm, $40,000; land unsold, $70,405; chemical and philosophical apparatus, $12,189; library, $8,750; farm property, including farm-stock, ten in number, and farm-implements, $2,550. This college uses the university buildings in common with the other departments. The property of the university, including all the departments, is valued at $800,000.

According to the law of the State graduates of any graded school in the State may be educated in the university free of tuition. Ninety-eight students have availed themselves of this privilege, 40 of whom are in the College of Arts; 30 of these attend lectures on agriculture, and 10 are pursuing the regular course of study in engineering. In the university, including all the departments, the number is 504.

Statistics for 1873 of the industrial institutions of the United States which have

Number of States having industrial institutions.	Location of the institution. State.	Location of the institution. Town.	Number of industrial institutions.	Name of the institution.
1	Alabama	Auburn	1	Agricultural and Mechanical College of Alabama
2	Arkansas	Fayettville	2	Arkansas Industrial University
3	California	Berkeley	3	University of California—College of Science and the Arts.
4	Connecticut	New Haven	4	Yale College—Sheffield Scientific School
5	Delaware	Newark	5	Delaware College
6	Florida		6	Florida State Agricultural College
7	Georgia	Athens / Dahlonega	7	University of Georgia. Georgia State College of Agriculture and the Mechanic Arts. North Georgia Agricultural College.
8	Illinois	Urbana	8	Illinois Industrial University
9	Indiana	La Fayette	9	Purdue University—Indiana Agricultural College
10	Iowa	Ames	10	Iowa State Agricultural College
11	Kansas	Manhattan	11	Kansas State Agricultural College
12	Kentucky	Lexington	12	Kentucky University—Agricultural and Mechanical College.
	Louisiana		..	(1. No industrial institution established in the State.)
13	Maine	Orono	13	Maine State College of Agriculture and the Mechanic Arts.
14	Maryland	(n'r) Hyattsville.	14	Maryland Agricultural College
15	Massachusetts	Boston	15	Massachusetts Institute of Technology
		Amherst	16	Massachusetts Agricultural College
16	Michigan	Lansing	17	Michigan State Agricultural College
17	Minnesota	Minneapolis	18	University of Minnesota. College of Agriculture. College of the Mechanic Arts
18	Mississippi	Oxford	19	University of Mississippi—College of Agriculture and the Mechanic Arts.
		Rodney	20	Alcorn University—Agricultural and Mechanical College.
19	Missouri	Columbia	21	University of Missouri. Agricultural and Mechanical College.
		Rolla		School of Mines and Metallurgy.
20	Nebraska	Lincoln	22	University of Nebraska—College of Agriculture
	Nevada		....	(2. No industrial institution established in the State.)
21	New Hampshire.	Hanover	23	Darmouth College—New Hampshire College of Agriculture and the Mechanic Arts.
22	New Jersey	New Brunswick	24	Rutgers College—Scientific School
23	New York	Ithaca	25	Cornell University—Industrial Colleges
24	North Carolina	Chapel Hill	26	University of North Carolina—College of Agriculture the and Mechanic Arts.
25	Ohio	Columbus	27	Ohio Agricultural and Mechanical College
26	Oregon	Corvallis	28	Corvallis College—State Agricultural College of Oregon.
27	Pennsylvania	Centre County	29	Agricultural College of Pennsylvania
28	Rhode Island	Providence	30	Brown University—Agricultural and Scientific Department.
29	South Carolina	Orangeburgh	31	Claflin University—South Carolina Agricultural College and Mechanics' Institute.
30	Tennessee	Knoxville	32	East Tennessee University—Tennessee Agricultural College.
31	Texas	Bryan	33	Agricultural and Mechanical College of Texas
32	Vermont	Burlington	34	University of Vermont and State Agricultural College
33	Virginia	Blacksburgh	35	Virginia Agricultural and Mechanical College
		Hampton	36	Hampton Normal and Agricultural Institute
34	West Virginia	Morgantown	37	West Virginia University—Agricultural Department
35	Wisconsin	Wisconsin	38	University of Wisconsin—College of Arts
	Total			

received the national endowment of land-scrip under the act of July 2, 1862.

Name of the president of the agricultural and mechanical college and of the university.	Number of professors and assistants in the agricultural and mechanical college for the collegiate year.	Number of students in the agricultural and mechanical college for the collegiate year.	Number of students in the agricultural and mechanical college pursuing agricultural or mechanical studies.	Number of students in the agricultural and mechanical college being educated from the United States land-scrip free of tuition.	Number of students entitled to be educated in the agricultural and mechanical college from the United States land-scrip free of tuition.	Number of professors and assistants in the university, including all the departments, for the collegiate year.	Number of students in the university, including all the departments, for the collegiate year.
Rev. I. T. Tichenor, D. D	7	102	53	31	136	....	......
Albert W. Bishop, A. M	3	58	58	58	219	3	241
Daniel C. Gilman, A. M	13	93	93	....	(b)	17	185
Rev. Noah Porter, D. D., LL. D	33	242	242	30	(c) 27	62	955
William H. Purnell, A. M	6	83	14	....	30	....	......
Hon. Jonathan C. Gibbs, president of directors.	....	(a)	....	....	24	....	......
Rev. A. A. Lipscomb, D. D., LL. D., chancellor.	12 8	151 209	151 45	....	220 (d)	23	521
John M. Gregory, LL. D., regent	20	161	161	....	(b)	20	402
Richard Owen, LL. D	2	(a)	....	....	(e)	....	......
A. S. Welch, LL. D	18	263	263	....	(b)	....	......
John A. Anderson	14	217	217	....	(b)	....	......
John B. Bowman, A. M., regent	9	181	181	81	300	30	558
Rev. Charles F. Allen, D. D	11	103	103	....	(b)	....	......
General Samuel Jones	6	130	130	....	(d) 60	....	......
John D. Runkle, Ph. D., LL. D	36	375	375	....	(e)	....	......
William S. Clark, Ph. D	9	139	139	....	(e)	....	......
T. C. Abbot, LL. D	7	143	143	....	(b)	....	......
William W. Folwell, A. M	10	3	3	....	(b) (b)	15	278
Rev. John N. Waddell, D. D. LL. D., chancellor.	12	5	5	....	(b)	17	303
Rev. Hiram R. Revels, D. D	5	40	40	....	(b)	5	179
Daniel Read, LL. D	13 6	138 75	138 75	....	(b) (b)	31	424
Allen R. Benton, LL. D., chancellor	3	......	....	....	(b)	7	92
Rev. Asa D. Smith, D. D., LL. D	9	22	22	....	12	33	420
Rev. William H. Campbell, D. D., LL. D	12	67	67	38	40	14	182
Andrew D. White, LL. D	11	151	151	....	512	47	461
Rev. Solomon Pool, D. D	....	(a)	....	....	90	....	......
Edward Orton, A. M	7	35	18	....	204	....	......
B. L. Arnold, A. M	6	50	50	....	44	6	125
Rev. James Calder, D. D	10	155	155	....	(b)	....	......
Rev. E. G. Robinson, D. D., LL. D	13	25	25	25	33	13	218
Rev. A. Webster, D. D	3	......	....	....	(d) 124	6	97
Rev. Thomas W. Humes, S. T. D	11	64	37	....	275	16	271
....	....	(a)	....	....	....	....	......
Matthew H. Buckham, A. M	6	21	21	....	(e)	15	71
Charles L. C. Minor, A. M	6	132	132	113	132	....	......
General Samuel C. Armstrong	15	215	126	42	(d) 100	....	......
Rev. Alexander Martin, D. D	8	29	29	....	36	14	144
Rev. J. H. Twombly, D. D	9	40	40	....	(d) 100	26	504
....	389	3,917	3,502	....	....	440	6,691

(a) The College is not opened to students.
(b) Tuition is free by law to all students belonging to the State.
(c) The trustees have increased the number to thirty.
(d) Tuition has been made free to all by the college trustees.
(e) All students pay tuition by the law of the State.

Statistics for 1873 of the industrial institutions of the United States which have

Number of States having industrial institutions.	Location of the institution. — State.	Location of the institution. — Town.	Number of industrial institutions.	Name of the institution.
1	Alabama	Auburn	1	Agricultural and Mechanical College of Alabama
2	Arkansas	Fayetteville	2	Arkansas Industrial University
3	California	Berkeley	3	University of California—College of Science and the Arts
4	Connecticut	New Haven	4	Yale College—Sheffield Scientific School
5	Delaware	Newark	5	Delaware College
6	Florida		6	Florida State Agricultural College
7	Georgia	Athens Dahlonega	7	University of Georgia. { Georgia State College of Agriculture and the Mechanic Arts. North Georgia Agricultural College. }
8	Illinois	Urbana	8	Illinois Industrial University
9	Indiana	La Fayette	9	Purdue University—Indiana Agricultural College
10	Iowa	Ames	10	Iowa State Agricultural College
11	Kansas	Manhattan	11	Kansas State Agricultural College
12	Kentucky	Lexington	12	Kentucky University—Agricultural and Mechanical College.
	Louisiana			(1. No industrial institution established in the State.)
13	Maine	Orono	13	Maine State College of Agriculture and the Mechanic Arts.
14	Maryland	(n'r) Hyattsville	14	Maryland Agricultural College
15	Massachusetts	Boston Amherst	15 16	Massachusetts Institute of Technology Massachusetts Agricultural College
16	Michigan	Lansing	17	Michigan State Agricultural College
17	Minnesota	Minneapolis	18	University of Minnesota, { College of Agriculture College of the Mechanic Arts }
18	Mississippi	Oxford Rodney	19 20	University of Mississippi—College of Agriculture and the Mechanic Arts. Alcorn University—Agricultural and Mechanical College.
19	Missouri	Columbia Rolla	21	University of Missouri. { Agricultural and Mechanical College School of Mines and Metallurgy }
20	Nebraska	Lincoln	22	University of Nebraska—College of Agriculture
	Nevada			(2. No industrial institution established in the State.)
21	New Hampshire	Hanover	23	Dartmouth College—New Hampshire College of Agriculture and the Mechanic Arts.
22	New Jersey	New Brunswick	24	Rutgers College—Scientific School
23	New York	Ithaca	25	Cornell University—Industrial Colleges
24	North Carolina	Chapel Hill	26	University of North Carolina—College of Agriculture and the Mechanic Arts.
25	Ohio	Columbus	27	Ohio Agricultural and Mechanical College
26	Oregon	Corvallis	28	Corvallis College—State Agricultural College of Oregon.
27	Pennsylvania	Centre County	29	Agricultural College of Pennsylvania
28	Rhode Island	Providence	30	Brown University—Agricultural and Scientific Department.
29	South Carolina	Orangeburgh	31	Claflin University—South Carolina Agricultural College and Mechanics' Institute.
30	Tennessee	Knoxville	32	East Tennessee University—Tennessee Agricultural College.
31	Texas	Bryan	33	Agricultural and Mechanical College of Texas
32	Vermont	Burlington	34	University of Vermont and State Agricultural College
33	Virginia	Blacksburgh Hampton	35 36	Virginia Agricultural and Mechanical College Hampton Normal and Agricultural Institute
34	West Virginia	Morgantown	37	West Virginia University—Agricultural Department
35	Wisconsin	Madison	38	University of Wisconsin—College of Arts
	Total			

received the national endowment of land-scrip under the act of July 2, 1862—Continued.

Value of the entire property of the agricultural and mechanical college.	Value of the property of the agricultural and mechanical college derived from the United States land-scrip under the act of July 2, 1862.	Value of the property of the agricultural and mechanical college derived from individuals and other sources than the United States.	Number of live-stock kept on the agricultural and mechanical college farm.	Value of live-stock kept on the agricultural and mechanical college farm.	Value of the farm-implements used on the agricultural and mechanical college farm.	Average price per acre for which the United States scrip or land was sold by the different States.	Number of acres sold of the United States scrip or land granted to the different States under the act of July 2, 1862.	Number of acres unsold of the United States scrip or land granted to the different States under the act of July 2, 1862.
$327, 500	$216, 000	$111, 500	....	....	....	$0. 90	240, 000	....
300, 000	135, 000	165, 000	(c) 2	$200	$160	90	150, 000	....
1, 087, 500	750, 000	337, 500	....	....	....	5. 00	150, 000	....
614, 000	135, 000	479, 000	....	....	....	75	180, 000	....
139, 000	78, 400	60, 600	....	....	....	87	90, 000	....
100, 134	81, 000	19, 134	....	....	....	90	90, 000	....
271, 000	243, 000	28, 000	....	....	....	90	270, 000	....
75, 000	70, 000	5, 000						
866, 308	395, 814	470, 494	240	6, 200	6, 518	70	454, 560	25, 440
510, 000	212, 238	297, 762	....	....	....	54	390, 000	....
968, 899	609, 528	359, 371	337	12, 839	11, 032	2. 33	5, 047	199, 262
458, 782	386, 543	72, 239	26	5, 898	975	4. 33	45, 391	36, 825
311, 000	165, 000	146, 000	100	5, 000	1, 500	50	330, 000	....
(a)	182, 630	....	....	....	....	87	210, 000	....
258, 620	118, 300	140, 320	55	2, 420	900	56	210, 000	....
210, 000	111, 000	99, 000	54	2, 000	1, 000	53	210, 000	....
968, 843	68, 843	900, 000	....	....	....	66	360, 000	....
491, 784	167, 464	324, 320	94	10, 650	2, 634			
929, 699	720, 723	208, 976	236	10, 191	3, 254	3. 21	64, 599	171, 074
357, 250	357, 140	110	2	300	750	5. 45	29, 200	64, 919
93, 460	75, 600	17, 860	....	....	100	90	210, 000	....
136, 055	113, 400	22, 655	141	1, 655	750			
(a)	....	....	7	500	1, 000	....	....	....
(a)	....	....	....	....	....	....	....	....
468, 000	450, 000	18, 000	3	425	375	....	....	90, 000
(b)	....	....	....	....	....	....	....	90, 000
240, 000	80, 000	160, 000	26	2, 000	2, 000	53	150, 000	....
292, 200	116, 000	176, 200	23	2, 200	1, 000	55	210, 000	....
2, 651, 998	1, 973, 403	678, 595	18	3, 535	1, 200	1. 56	576, 000	414, 000
(a)	135, 000	....	....	....	....	50	270, 000	....
904, 000	342, 451	561, 549	....	....	....	52	630, 000	....
239, 000	225, 000	14, 000	....	....	50	....	....	90, 000
897, 589	439, 186	458, 403	171	8, 487	6, 816	56	780, 000	....
56, 000	50, 000	6, 000	....	....	....	42	120, 000	....
200, 800	130, 500	70, 300	....	....	....	72	180, 000	....
397, 190	271, 875	125, 315	5	690	500	90	300, 000	....
291, 240	156, 600	134, 640	....	....	....	87	180, 000	....
416, 972	122, 626	294, 346	....	....	....	82	150, 000	....
225, 000	190, 000	35, 000	25	2, 500	1, 500	95	300, 000	....
266, 448	95, 000	171, 448	43	3, 466	1, 538			
155, 000	90, 000	65, 000	....	....	....	60	150, 000	....
359, 204	300, 000	59, 204	10	1, 050	1, 500	1. 25	183, 676	56, 324
17, 535, 475	10, 560, 264	7, 292, 841	1, 618	82, 146	47, 047	....	7, 808, 473	1, 237, 844

(a) No full report of the property of this college has been received.
(b) No report of the present value of the congressional grant has been received from this State.
(c) Twenty-one colleges keep stock on their farms.

AGRICULTURE IN JAPAN.

BY HON. HORACE CAPRON,

Formerly U. S. Commissioner of Agriculture.

The great antiquity of agriculture in Japan, the rigid adherence to the most ancient modes of cultvation, the incomparable cheapness of labor, the thorough character of the tillage, the economy and application of fertilizers, the extent and completeness of the system of irrigation, (which utilizes the whole water-system of the empire,) and the high and continued fertility of the soil after thousands of years of successive croppings, are all of the highest interest to the agriculturist in America. A general knowledge of the character of the soil and climate of any country is a condition-precedent to an intelligent comprehension of its agriculture.

Those islands of the Japanese group which are settled are situated between the parallels of 32° and 42° north latitude. Agriculture in Japan, therefore, occupies the same parallels of latitude that it does in the United States, that is, from the latitude of the capes of Florida on the south to the latitude of the British boundary on the north. The largest and most central island—Niphon—of which this article will treat mostly, has a latitude which would give it a mild, temperate climate, but there are other influences which are perhaps even more powerful than that of mere latitude.

The modifying effect of surrounding bodies of water upon the climate of islands and narrow peninsulas is well understood. It renders the winters comparatively warmer and the summers cooler, as, for example, the islands of Great Britain, and the State of Michigan in the United States. So, here, from the narrowness of these islands, the surrounding bodies of water equalize the temperature of every part of them. As in the case of Great Britain, there is the additional and more powerful influence of streams of thermal waters, like the Gulf stream, which wash both the eastern and western shores of the Japanese group. This warm "river in the ocean" takes its rise under the tropical sun, far south, and runs north along both the east and west shores to their northern junction. From whatever direction the currents of air come inland they bear the warm breath of these thousand streams fresh from the spice islands of the Indian Ocean, through the inland valleys, over the hills and high up the mountain sides, moderating the heat of summer and tempering the cold of winter, till all the seasons become almost one perennial spring.

The bluffs, hills, and mountains in every part of the islands are covered with forests of pine, cedar, fir, cypress, beech, birch, maple, oak, bamboo, palm, and in fact with every variety of tree or shrub known in the temperate and tropical climates, which meet and blend so perfectly here that their influence upon the climate and rain-fall must not be overlooked. In this connection it may be proper to say that these uncivilized people, as they are called, have adopted a policy the very converse of that followed in America and Europe in relation to these protecting coverings of nature. The Japanese government has preserved their forests, and in fact insured their increase. No license to cut down a tree is granted, except upon the condition that three more shall be planted and grown in its stead.

The utmost range of the mercury during the year 1873 at Yedo (latitude of Raleigh, N. C.) was 65° F. The hottest day of the summer was 91°, and the coldest night in winter was 26° above zero. Only two or three times did the mercury touch 32°, the point of frost. The mean temperature for the winter months is 45°, of the spring months 56°, of the summer months 75°.50, and of the autumn months 64°. The mean annual temperature, therefore, is 60°. This is a remarkable mean, when we consider that in the heat of midsummer the mercury only rises to 90°, and in the winter seldom goes as low as the freezing point. December shows the highest temperature of the winter months, having a mean of 48°.75. January and February have had the same temperature for the past ten years, the mean of both having been 42°. The climate for these three months has, in addition to its mildness, the advantage of being dry, as the reader will see when I come to speak of the rain-fall. March is 4° warmer than February, having a mean temperature of 46°. April is the first real spring month, being 12° warmer than March, and having a mean of 58°. June has a mean of 68°, and July of 78°. August maintains her universal reputation of being the hottest month by having a temperature of 81°. The extreme mildness of the winter months is best illustrated by the fact that the tillage and growth of a great variety of vegetation goes on the same as in summer, and the fields are as green as during spring. Thus comes the universal practice, unknown to our agriculture, of following the harvesting of one kind of crop immediately by the planting of another kind on the same ground. Agriculture has no winter of rest and inactivity here. The husbandman sows, and tills, and reaps through all the seasons, year after year, of his life. Every month has its planting-time for some kind of vegetation, and its harvest for others, generally of the simplest kinds of food-products.

It is these climatic influences, together with a perfect system of irrigation, high cultivation of the soil, augmented by the application of every available material which will increase its fertility, gathered with scrupulous care and applied with a lavish hand, that enable the farmers of Japan, without foreign aid, and with half its agricultural capabilities untouched, to supply its dense population of over 33,000,000 of people.

Japan has a rain-fall as great, and in some localities greater, than in Oregon and Alabama, (which have by far the greatest precipitation of moisture in the United States.) In Japan the annual rain-fall along the sea-shore is 58 inches. In the interior, at the foot of the mountain ranges, the fall is much greater, in some places amounting to 75 inches. The warm months are the rainy ones. The winter has little rain, less than 2 inches per month; the spring from 10 to 15 inches of rain; the summer months from 20 to 25 inches; and the autumn months from 18 to 20 inches. Such a mild temperature through the whole year, with such a great amount of moisture, gives every portion of the empire a luxuriant growth of vegetation, unknown in the United States, except perhaps in the cane-brakes of Louisiana and Florida. All the valleys, bluffs, hills, and mountain-sides are covered with a dense growth of tall coarse grass. There are no barren lands. On the Hakoni range of mountains—the highest range in Japan—at an elevation of nearly 9,000 feet above the sea-level, the highest peaks grow a coarse grass, from 3 to 4 feet high.

Such an amount of vegetation, growing annually and going to decay, has formed a black vegetable soil from 4 to 8 feet deep. The whole surface of the country is uneven; there are high hills and bluffs everywhere; and lying between them there are deep and often narrow valleys. The whole country is of volcanic origin; and, underlying this black vegetable mold, and more or less mixed with it, the whole geological formation

is rich in all those saline and alkaline materials with which volcanic formations abound. The hills and bluffs are volcanic upheavals, and the deep, narrow valleys were once merely arms of the sea; but in time the *debris* from the outpourings of the volcanoes, and the weathering of the formation of the upheaved bluffs and hills, gradually filled up these intervening spaces, and the waters retiring, these valleys were formed. Since that unknown time, through silent centuries, the disintegrating of the rocks and the luxuriant vegetation on the hills and bluffs have been carried into these valleys, till now the soil is in many if not most of them 20 to 30, and in some even 40 feet deep.

From the main mountain ranges, some of which have an average elevation of 8,000 feet, large rivers take their rise, often so wide and deep as to be navigable for miles from their mouths. The lower hills and bluffs give rise to smaller streams, which thoroughly water the whole country. Springs abound everywhere, and wells with pure cool water can be had by digging from 6 to 18 feet from the surface. With their great rain-fall, three times as great as the average of the United States, and with their abundance of living streams and springs, these agricultural people have found irrigation so useful and beneficial that they have constructed a vast and universal system of irrigation by immense labor. Reservoirs have been built everywhere on the higher grounds, from which a perfect net-work of great and small canals radiates to all the tilled land. The system of irrigation known to us as practiced by the Moors in Spain, by the Aztecs in Mexico and Peru, and by the ancients in Egypt and India, was confined to limited districts; here it is in every valley and on every hill-side, and is as old as their occupation of the islands.

What a lesson is there here for us in America! With only one-third of their rain, with a country comparatively easy to irrigate, and with such an inland water system as is unknown elsewhere, we allow immeasurable volumes of water to be carried to the ocean unused year after year, while our crops fall each season far short of the possibilities of the soil, and fail almost entirely often as every seventh year.

As faulty as the Japanese land system is, in many respects it insures thorough tillage. The title to the soil is retained by the government, and the land is leased for a term of ten years, with a privilege of renewing perpetually, on the condition of thorough cultivation; failing in these conditions, the lease is canceled and a good farmer sought for.

FARMERS,

as a class, in feudal Japan were next in rank to the "men at arms." They were the second class in the empire, the manufacturers, artisans, and merchants being socially far below them. Although this high rank imposed many onerous duties, it was of the greatest benefit to them. As landed gentry they had important privileges, and they were universally educated. They were able to employ the best talent to teach their children. Promotion from their class to that of the men of arms was not frequent but it was possible. The high rank of the farmers under this system had much to do with the high character of agriculture, which grew up under the feudal rule.

Labor is cheap and abundant in all parts of the empire. Since the opening of the ports to foreign trade, and the commencement of exportation, prices of agricultural products have been enhanced and labor has risen in proportion; especially is this true around the open ports, where the native labor has come into competition with foreign. Notwithstand-

ing this, a first-class farm-hand receives only from $40 to $45 per year, and he boards and clothes himself. All other labor brings proportionate prices. Women who work in the home, either as house-servants, spinners, or weavers, or at other manufactures, or in field-service, receive much less. The average price of women's wages in Japan is less than $30 per year, and they furnish their own board and lodging.

The farm laborer's food is of the simplest kind, and is proportionately cheap. They eat boiled rice, boiled wheat, boiled barley, and a variety of vegetables, generally turnips, boiled and mixed with the rice, barley, or wheat.

They may be able to afford fish once or twice a month for a holiday-feast, but if so, it is of a cheap, poor kind. It may be said that their diet is exclusively vegetable; they never eat animal food, or fowls or eggs—yet they are always fat, stout, and hearty. They labor at all times of the year in the field, men and women together, almost if not quite as naked as they were born. They are muscular, active, and skillful, and quiet, honest, and faithful.

As little as the compensation of these laborers is, and simple and even meager as their diet may seem, they are not the overworked and poverty-stricken class that may be found in some parts of Europe.

The eight-hour system has been practiced in Japan for centuries. There is an endless number of holidays also. The 1st, 6th, 11th, 16th, 21st, and 26th of each month are invariably holidays. Then the more important of food crops have their harvest holiday or days, and there are religious holidays and Government holidays. All these are celebrated by gatherings in towns and villages, temples and groves. There is music, and there are brilliant decorations of flags and lanterns, and there is singing and dancing, and these laborers are jolly and happy. They sing as they dig, sow, and hoe; they sing going to toil, and they sing returning from it.

Such is the soil, such the climate, and such the natural advantages of Japan for agriculture. No wonder, then, that without a foreign market for their surplus products, even without the stimulus of competitive intercourse with the world, agriculture has flourished and become the leading industry.

It could not be otherwise, for nowhere on the green earth under the sun had Mother Nature been so prodigal of her choicest gifts to the husbandman. There are about 30,000,000 acres under tillage in the empire. Every inch of these 30,000,000 acres is under the most complete and thorough tillage. If the reader has ever seen the cultivation of the gardens in the neighborhood of great cities, he can have a just conception of the appearance of the farm-land in Japan. The whole cultivated portion is a garden. Two-thirds of the entire area cultivated grows both summer and winter crops.

The implement that stirs the soil is either a spade or hoe, which loosens it to the depth of from 12 to 15 inches. A rude plow is sometimes used, but it is mostly drawn by hand. The implements are the same as were in use a thousand years ago, and the modes of cultivation have remained the same through all that time.

RICE.

Rice is the staple crop of Japan. In the present state of the census reports it is impossible to give the exact acreage of rice. The report of 1870 places the number of acres at 8,000,000. Whether the area devoted to cultivation is increasing or not, it is impossible to tell.

The production has been controlled entirely in the past by the home demand. Now that the imperial edict forbidding its export has been repealed, the production will be stimulated by the world's demand.

The last "Red Book" of the Tycoon gives the total income of the Daimios, which was always paid in rice, at 6,000,000,000 pounds, or 111,000,000 bushels. This did not include the income of the Mikado's court at Kieto, for the support of which the income of the five richest provinces of the empire were set apart. Thus the rice product was able to pay a tax of from seven to eight billion pounds annually.

Ninety-five per cent. of the rice of Japan is low-land rice; almost the whole of the valley land is devoted to rice growing. It is the richest soil, and is the best adapted to irrigation. The land is divided into small lots, scarcely ever more than an acre in one lot, and often less than one quarter that amount, and embanked. This is thoroughly leveled, so as to be entirely flooded. All the soil removed in leveling is put on a lesser space adjoining, which is planted in vegetables. The rice-ground is thoroughly flooded several times, on different days in April, after which it is dug up with a heavy hoe. This hoe or spud is unlike any civilized implement. The blade is about 16 inches long and 4 inches wide, and will weigh from 6 to 8 pounds. The handle is 5 feet long. With a powerful blow it is sunk the full length of the blade into the soft soil, and with the long leverage of the handle a large amount of earth is lifted up and turned over. This process is slow, but it leaves the soil in a much better condition than can any plow. At 12½ cents as the whole cost of a day's labor it does not cost much more to dig up an acre of *tilled land* to this depth than it does to plow an acre with us. In May the seed-rice, about one and a half bushels, is put upon an acre; it is first sown upon a small piece of ground. The 5th day of June is the national thanksgiving (transplanting) day, when these thickly sown stalks are pulled up and transplanted in the rice-paddy, where it is grown, the soil having been prepared by thorough flooding till it is completely saturated. After the transplanting it is again flooded, and while in this condition 800 pounds of rape-seed oil-cake, or sardine oil-cake thoroughly pulverized, and costing from $8 to $12, is sown to the acre. The water is then turned off, leaving this soaked fertilizer at the root of the rice-stalks. After frequent floodings during the summer, it is harvested in October. It is cut with a sickle something like a corn-knife, bound in bundles, and carried to high ground, dried, and thrashed at leisure, or rather shelled by drawing the heads of a small handful through a crude hetchel.

The cleaning or winnowing is done by pouring the rice from a basket or bucket upon mats by one person, while another fans it with a large paper fan.

All this work of cutting, binding, shelling, and cleaning is done by women, who, while cutting and binding, stand bare-legged in the water 10 to 12 inches deep. The rice is then put into small straw bags, about 130 pounds in each, and sent to the mills on the backs of men or horses, where it is hulled by water-power, or by the primitive mortar and pestle worked by the feet. From the interior horses are used to carry the rice, 300 pounds being the average load to a horse. A good horse, with a man to lead him, will earn 50 cents a day, out of which the man is fed and the horse fed and shod.

The average yield is 50 bushels to the acre, and the average weight of lowland rice is 53⅓ pounds to the bushel, making 2,666⅔ pounds to the acre. It requires 80 days' labor to each acre from the first flooding till the rice is marketed.

The result per acre of rice-raising can be stated as follows: Labor, \$18; manure, \$8; interest on \$100 at 10 per cent., \$10; total cost, \$36; 2,666⅔ pounds of rice, at 2½ cents, \$66.66⅔; total profit, \$30.66⅔.

If the above was a real profit, the farmer could make a favorable showing; but the Government tax is claimed by the farmers to be 50 per cent. of this profit, leaving only \$17 to \$18 per acre.

As I remarked before, 10 acres is a large amount for one proprietor, and many have one acre or less. The upland rice is sown at the same time, and flooded and manured in the same manner; but the yield is far less and the profits proportionably small. The lowlands rest during the winter, but the uplands are immediately dug up and fertilized with rice-bran or hulls, or horse-manure, rice-straw, or liquid manure from water-closets, at a cost of about \$4 to the acre, and sown in wheat or barley.

WHEAT

is sown in November in drills 16 inches apart, one and a quarter bushel of seed to the acre. In three or four weeks a row of pease, turnips, onions, cabbage, or some other kind of vegetable, is planted between these drills, and then the wheat is regularly hoed and irrigated with the vegetables.

In April and May the wheat is ready to harvest. It has a short, but, compared to the straw, heavy head. The stalk seldom grows higher than 2 feet, and often not more than 20 inches. The Japanese farmers have brought the art of dwarfing to perfection. They claim, and truly I believe that the straw of their wheat has been so dwarfed that no matter how much manure is used it will not grow longer, but that the length of the wheat-head is increased. Certain it is, that on their richest soils and with the heaviest yields the wheat-stalks never fall down and lodge on the ground, to the great injury of the crop, as in the United States.

The process of cutting, binding, threshing, or shelling is the same as with rice. It is put into the same straw-bags or holders and sent to market on the backs of horses. I did not fully explain the earnings of these packers. They are paid one cent per hundred pounds for every mile, and as they carry 300 pounds, they earn 3 cents for every mile. Fifteen miles is about the average distance traveled in a day. The earnings of a packer and his horse per day is therefore 45 cents. The horse's shoes are an important item of his expenses. These shoes are made of plaited straw, and cost 4 to 5 cents a set. In a stoney country like Japan these straw shoes are quickly cut through. It requires two sets per day. The shoes for each day cost more than the man's food, possibly more than the horse's. The average yield of wheat per acre is 12½ bushels. It requires only thirty days' labor to raise an acre of wheat.

In making a statement of the cost and results of raising an acre of wheat, it must be borne in mind that the same acre raises three other crops, the same year. The statement, therefore, would be as follows:

Interest on value of an acre of upland, \$40, at 10 per cent., \$4; labor, (30 days' work,) \$3.60; manure, \$4; total cost, \$11.60; seven hundred and fifty pounds of wheat, at \$2.50, \$18.75; profit on an acre, \$7.15.

To this must be added the profit of the vegetables raised at the same time as the wheat, and also the profits of the upland rice and vegetables in the summer, all of which will sum up to nearly thirty dollars per acre, making the wheat-land fully as profitable as that which grows the lowland rice. The reader will see what an enormous produc-

tion there is from this acre of high sandy upland, 12½ bushels of wheat, a crop of upland rice, and two full crops of vegetables. Such a drain upon the soil is unknown in the United States. Yet all this upland of which I write has been tilled in this way and subjected to this enormous annual drain for fifteen hundred years, as shown by the written history of these people; how much longer is unknown; still it yields as much now as ever, and perhaps more.

BARLEY

is ground the same as wheat, except that the seeding is heavier, and the yield is 25 bushels to the acre. Barley sells for one-half the price of wheat; the profits are therefore about the same. Barley is fed to horses, cattle, hogs, and fowls, and is also boiled and eaten by the lower classes. Boiled wheat is much eaten by the people, and wheat is now being exported to China.

COTTON

is a crop second alone in importance to rice. Cotton clothing is as universally worn as rice is universally eaten. Cotton is raised everywhere south of the fortieth parallel of latitude. North of the thirty-sixth parallel it is only grown by families for their own manufacture and wear. That grown so far north has a short, coarse staple, and is little sought for in market. South of the thirty-fifth parallel the crop is good and the staple fine, long, and strong.

The exact acreage and amount of cotton raised in Japan is unknown. The amount produced up to the present time has been entirely controlled by the home demand. Hereafter, when the better varieties have been introduced, and they learn to grow and prepare it as demanded in the markets of the world, it will be an important article of export. I should say rather that, with the enterprise and energy displayed in adopting improved machinery, and with their abundant and incomparably cheap and ingenious labor, and with their boundless deposits of coal and iron of the best quality, and their abundant water-power, cotton goods ought in time to be an important item of their exports.

The requirements of the cotton-plant in Japan are, a light sandy soil and an exposure opposite to that of the sea, as an exposure toward the sea is unfavorable. It is that kind of soil that rice does not seek, and there are many millions of acres on which it could be raised successfully which now are not used for any agricultural purpose. The soil is thoroughly spaded or hoed up, and the surface laid out in rows a foot apart, and in the trenches is put the manure, 4 or 5 inches below the surface, which may be horse-manure, rotted straw, or liquid manure from closets; if the latter, it is applied on the surface or mixed with rice-bran and buried in the trenches. The average cost of these fertilizers to the acre is $8 to $10. The seed is sown 4 or 5 in a place, 12 inches apart, then covered lightly with earth not over 1 inch deep. The plant appears above the ground in fifteen to twenty days, and when 3 or 4 inches high all but one are pulled out. In a few days the plants are hoed and slightly hilled. Then between the rows of cotton a trench or furrow is dug, manure of some kind is placed in it, and pease or some other kind of quickly-maturing vegetable planted; four to six dollars' worth of manure is used for these vegetables. Early in September the cotton-plant flowers, and in October the bolls are filled and ready for picking. Women are employed for this work. The plants are short, not more than 18 inches high. The cotton is prepared by a crude gin with wooden rollers, and is then packed in bales of 100 pounds each. The average yield of an

acre is 666⅔ pounds. The ruling prices for several years have been from 18 to 20 cents per pound. Seventy days' work from the first spading up to the completion of the bailing, are required to each acre, costing $8.75.

As soon as this cotton and vegetable crop is removed one of wheat and vegetables is raised, as I have described in speaking of wheat. I cannot refrain from again calling attention to the enormous drain annually made upon this light upland soil, and that, notwithstanding this it is more fertile now than a thousand years ago. This acre of cotton-land produces 666⅔ pounds of cotton, 12½ bushels of wheat, and two full crops of vegetables every year. Such a production is unknown elsewhere in the history of agriculture. Cannot our farmers learn from this single acre of land, which has been a mine of wealth to its tillers for a thousand years, and still gives its golden return for all the labor and for all the fertilizers so lavishly bestowed upon it, that thorough tillage of a small area of land, well fertilized, is much the more profitable? In the United States the farmer tills for the present, taking away from the soil annually its fertility in the products it yields, without any adequate return, and his sons inherit an impoverished soil in consequence of his prodigal and wasteful tillage.

TOBACCO.

In the cultivation of tobacco I will give in detail more fully the application of manures, so that, in contrast to our robbery of the soil, it may be seen how a Japanese farmer pays a just equivalent in advance for all that he expects from it. Light, sandy, upland soil, with a northern exposure, is desirable, as the wind from that direction assures to some extent against insects and worms. The ground is thoroughly dug up in the usual manner to the depth of 14 to 16 inches. Holes, 16 inches apart for the manure, are dug twenty days before planting in rows that are 12 inches from each other. Rice-bran, mixed with liquid closet-manure or some kind of oil-cake, is put in the holes and mixed and covered with earth. The seed is planted about the 20th of March. About the 5th of April the plants are well above ground. If needed, all the plants are irrigated six times during June, July, and August; liquid manure of some kind is applied at the roots of each plant. There is very little barn-yard manure in Japan, and from this fact and from the continued high tillage there are no weeds, and no ground that requires hoeing more than once to kill the weeds. The ground is often stirred up with the long-bladed hoe, dragged along by hand, like a small corn-plow. In May a crop of some kind of vegetables is planted between the rows of tobacco. The plants are slightly hilled. By the 1st of September the lower leaves of the stalk are picked and hung up, two and two, and dried, and then pressed in bales of 33⅓ pounds weight. Then more liquid manure is put to the roots of the plant, and by the 1st of October the second picking takes place, when the middle leaves are picked, dried, and packed, the same as the first picking; then more liquid manure is applied, and in a month the third picking takes place, and the top leaves are picked, dried, and packed. The second picking is the best tobacco; the first is the second best, and the third is the poorest. The first-class tobacco is worth $4 per hundred pounds, the second class $3, and the third class $2 per hundred. The average price, when it is all mixed, as it often is, is $3 per hundred. The average yield per acre is 4,000 pounds. The cost of manuring through the whole season is $20 per acre. The vegetable-crop was gathered previous to the last picking, and the ground at once dug up and thoroughly manured again, and wheat and vegetables planted.

SUGAR.

The growing and manufacture of sugar is one of the most important branches of Japanese agriculture. Here in Japan, as everywhere in Europe and America, sugar has become a necessity rather than a luxury with all classes. It is used in some way or other at every meal. The grades of sugar in common use are low. In fact, the processes of clarifying and refining are so crude that the best grades of sugar are not made in Japan. As in the case of cotton and tobacco, sugar-cane grows best south of the thirty-sixth parallel of latitude, still it grows and is profitable farther north. Seed is not sown, but sprouts are set out. These sprouts are obtained by selecting large, fine stalks in September, cutting and stripping them of their leaves, and then burying them under ground in trenches 10 to 12 inches deep. From each joint sprouts grow through the winter, and in the spring the trenches are opened, and the sprouts, six or eight inches in length, are set in the ground that has been thoroughly hoed up and laid out in rows, and manured in holes the same as tobacco. The manure is fish oil-cake. The rows are 12 inches apart, and the plants are set 24 inches from each other in the rows. A ton or more of this oil-cake is used to the acre, costing $20 to $24. No other crop is raised with sugar-cane. During the summer the cane is thoroughly hoed and hilled, and, if necessary, irrigated. Liquid manure is applied several times to each stalk. In September the stalks are selected for growing the sprouts for the next year's setting. If 20,000 settings are required 1,000 stalks are cut and buried. In November the cane-crop is cut and stripped of its leaves, and when dried two or three days each stalk is broken and stripped of its bark or outside covering, leaving only the center or pith, which is ground between stone rollers. The cane-juice is boiled so thick that it granulates in the pans to some extent. Then, when cooled and granulation has taken place, it is put in cotton bags and pressed dry. The sirup that is expressed is reboiled and sold as molasses. The sugar is sold to the clarifier and refiner. Of raw sugar the average yield is 3,300 pounds to the acre, and is worth $4 per hundred.

Sugar-cane is grown on upland soil, and requires more labor and a greater amount of fertilizers than any other crop raised in Japan, and is, notwithstanding, its most profitable crop. The present need of the Japanese sugar-producer is the introduction of the improved processes of clarifying and refining. With an abundance of raw sugar of the best quality, they are at present importing large amounts of the better grades for home use, their treaty with foreign governments only allowing a duty of 5 per cent. to be levied on foreign sugars. When the required processes are introduced and perfected, Japan will become a great sugar-exporting country.

HEMP

is raised on valley-lands, which are dug up and flooded the same as for rice, and the same kind of fertilizers are used, that is, rape-seed or fish oil-cake, straw-manure, sea-weed, or liquid manure from closets. The hemp is not sown broadcast as with us, but is planted in March in drills 16 inches apart. As soon as the plants are well up they are hoed, and in addition to the manure worked into the soil previous to the planting, two or three times each month liquid manure is applied to the roots of each plant. Between these drills some kind of vegetable is grown and thoroughly fertilized. The ground is completely flooded several times by means of the ubiquitous irrigating ditches. In August the hemp is pulled, not cut,

and is placed in the water-ditches and alternately soaked a few days and then dried for a time, till the external coating is thoroughly rotted; it is then beaten on a board or plank platform with a bamboo stick till the fiber is entirely cleaned. Another method for separating the fiber is by holding a number of the stems near their tops with the left hand, (an equal number at each time,) and with the right hand breaking them short off and stripping the fiber from the stems. This leaves it in hanks of a uniform size, which is retained through the whole process until baled for market. To relieve the fiber of its glutinous coating is a very simple process. A thin piece of bamboo, about 3 inches wide and 2 or 3 feet long, is stretched over two bridges in a manner similar to the hairs on a fiddle-bow, so as to render it elastic; this is fastened in a convenient manner a little inclined. The hanks of hemp in their *damp state* are laid upon this as they are stripped, then another piece of bamboo, curved like a currier's scraper, is run down over this several times till the fiber is entirely clean. These hanks are then hung over bamboo rods to dry. It is then pressed into bales of 100 pounds each, and sent on pack-horses to market. It is probably the finest hemp grown in the world. The great length, fineness, glossiness, and strength of the staple are unequaled.

I have been unable to ascertain the average yield of hemp per acre. It is sold very low in the market at present, but when the proper machinery is invented for working this fiber it will prove a mine of wealth to Japan.

FLAX

is grown on the same soil as hemp, and manured the same, and prepared in like manner for market. It is also noted for its excellence. These two crops are raised by rotation, that is, are never grown two seasons in succession on the same ground.

FRUITS

of some kinds are grown in all parts of the empire. The soil and climate are especially adapted to the growth of semi-tropical fruits. The former exclusiveness of Japan prevented the introduction of the better varieties. Isolated as they were, they contented themselves with half a dozen inferior varieties. Oranges, limes, lemons, grapes, persimmons, pears, and some blackberries, all very inferior, (excepting one variety of orange and one of grape,) were all they had. They have wonderful skill in dwarfing fruit-trees. All kinds are dwarfed without diminishing the size of the fruit. I think our fruit-growers could learn much from the Japanese in this matter. I have seen acres of pear-trees not more than 4 to 6 feet high. These trees were set out in rows, about the same distance intervening. At the height they want the trees to grow, say 4 or 6 feet, a lattice-work of small bamboo poles is built over the whole orchard. As soon as the shoots of the pear-tree grow to this lattice, they are trained to run along it horizontally, and are confined to the poles by hempen strings. When first seen it looks like a grapery. The wind cannot shake the trees to disturb either the flowers or the fruits. The most perfect system of training and control over the new growth is in use, so that the sap of the tree, instead of being consumed in the production of a superabundant growth of new shoots, is directed to the growth and perfection of the fruit.

When the new fruits now being introduced into Japan by the Kaitakushi department are disseminated everywhere, Japan will become

one of the finest fruit countries in the world. All that is wanting will then be supplied. They have soil, climate, and skill in dwarfing and training far superior to that of any other country. The same may be said of the cultivation of vegetables, and those very inferior.

Of the MULBERRY-TREE and TEA-PLANT I shall not write, they having received full attention from others. Of GRAZING, I will only say that, with a population of thirty-three and one-half millions, there are only 300,000 horses, and 70,000 head of horned cattle, and no sheep.

The grazing area on the bluffs, hill, and mountain sides of Japan, unoccupied for any other purpose, is greater than the grazing area of all the British Islands and Ireland. The attention of the Japanese government is being attracted to this important subject, and it will not be long till this great resource will be utilized.

I cannot close this article without again referring to the system of irrigation, which enables these people to realize the highest possibilities of the soil, in all seasons, with all kinds of crops. Their system of ditches is so arranged as to act as an equalizer of moisture; if it is a dry season they supply the deficiency from the reservoirs; if it is an excessively wet season they drain away the surplus moisture. It is a matter well worth all the attention our American farmers can bestow upon it. The Japanese system of fertilizing is just as admirable. In the whole empire not one particle of material that can be used to fertilize the soil goes to waste; all the grass of the bluffs and the straw of the rice, barley, and wheat is saved; all the drippings on the streets and highways are carefully gathered. The refuse from the extensive fisheries is utilized, and sea-weed is gathered in great quantities and used. In all the towns, villages, and cities the manure of the closets is entirely saved and applied to the surrounding lands. In the city of Yedo alone millions of dollars' worth of fertilizing material is saved which in the United States would be lost to agriculture. The savings from the closets of thirty-three and a half millions of people has an important influence upon the agriculture of Japan, and the economy of this fertilizing element, which we lose in the United States, is the most important of all.

What an instructive lesson for the American farmer may be gathered from a careful consideration of the agriculture of these people! The whole area of the *settled* portion of the Japanese Islands is not much larger than the New England States. Upon this is concentrated a population nearly as great as that of the whole United States. The thrift, economy, and skill in agriculture, without live-stock to convert the luxuriant vegetation of the unoccupied land into manure for their tilled fields, or any system of *rotation* of *crops* supplemented as with us by the renovating clovers, and unaided by mechanical appliances of any sort, the Japanese farmer produces annually from one acre of land the crops which require four seasons under their system in the United States. Thus the food of this vast population is supplied without the importation of a single article, and still not one-half of the land is under tillage. There is nothing in the agriculture of our country that can bear a comparison with this. The *grand secret* is, drainage, irrigation, economy and application of fertilizers, and thorough tillage.

DIGEST OF STATE REPORTS.

CALIFORNIA.

The transactions of the California State Agricultural Society for the year 1872 contains a vast amount of matter of great interest to the farmers and fruit-growers of the Pacific States and Territories. In addition to the transactions of the State society the work contains reports from the officers of many district and county organizations, and essays and addresses on various subjects of paramount importance to the people of the Pacific slope. The volume is well printed, and covers some 800 pages.

The board of directors congratulate the people of the State upon the fact that the past season was one of greater abundance of the staple products than the State had ever before known, and that the present season (1872) promises even a greater yield. The wool-clip for 1871 aggregated 24,255,468 pounds. The wine vintage for the same season was estimated at 10,000,000 gallons, while the fruit-crop exceeded that of any previous year. It was thought that the wheat-crop had not fallen much, if any, below the enormous yield of 30,000,000 bushels. The yield of corn, oats, barley, rye, &c., was also unusually large, and generally of an excellent quality.

Owing to the high price of sacks and the limited facilities afforded for transporting this immense yield of grain to market, the producers received but a small profit from the crop. In an appeal to the farmers to provide against such contingencies hereafter by purchasing a portion of their sacks early in the season, and providing warehouses for the proper storage of their grain until reasonable rates of transportation can be secured, the directors say:

> Nearly all our grain-sacks are now made of the fiber of a plant called jute. The principal place of production of this plant is now in India, in the British possessions of that country; and the principal place of its manufacture, not only into cloth, but into sacks, is Dundee, Scotland. The cost to the farmers of California to sack their last crop of wheat was not less, but probably more, than $2,450,000. At the ruling prices of wheat at the time these sacks were bought and paid for, it required 2,722,222 bushels of wheat, or a little more than one-eleventh of all the wheat produced, to pay for them.
>
> This large amount of money, then, was transferred from the profits of the farmers to pay the labor of producing the raw material in India, thefreighting of that raw material to Dundee, the manufacturing it into sacks at that place, and, finally, freighting them to San Francisco, and distributing them throughout the State, with the addition of the profits of the merchants, brokers, insurance houses, &c.
>
> The question arises, how can these enormous expenses be saved in the future? Our answer is, let our farmers produce their own jute and California labor manufacture it. We here venture the opinion that our rich bottom-lands, particularly those in the southern portion of the State, where the facilities of irrigation are at hand, will produce not only as good a material, but as abundantly, as the best localities in India. Let the farmers at once take steps to secure the seed, and distribute it in small parcels among their numbers for planting and cultivation the present year. The first effect of such an undertaking so generally entered into will be the reduction of the price of sacks; and the next will be the demonstration of the fact that jute is one of the permanent and profitable products of the country. By the slow and discouraging process of individual effort, it has taken ten years to demonstrate the fact that California is a good cotton-producing country; by a general effort one year will settle the question as to jute.

The directors also urge the general cultivation of hemp, New Zealand flax, ramie, silk, coffee, tea, opium, rice, and the various kinds of tropical fruits, such as the pine-apple, banana, mango, cocoanut, plantain,

loquat, Chinese guava, date, and many other valuable products and fruits, which have been produced in abundance by individual experimenters in different localities of the State.

President Charles F. Reed, in his opening address before the society at the State fair of 1872, urged upon his hearers the great importance of a diversified system of agriculture. He said:

It is evident that for a long series of years we shall continue to be large exporters of wheat. In order, therefore, successfully to compete with other wheat-exporting countries, and render this branch of agriculture self-sustaining and profitable, we must, in the first place, adopt a system of cultivation by which, while we materially reduce the cost of production, we can at the same time keep up the fertility of the soil. Our present mode of shallow cultivation, considered in connection with the expense and difficulty of adding to the soil the necessary fertilizing ingredients, is very unsatisfactory, and, if continued, the day is not far distant when our lands will become so far exhausted that the value of our crops will fall below the necessary expense of our present costly system of cultivation.

Cultivation with the steam-plow has been an established success in England for the past twelve or fifteen years. Germany, France, the Argentine Republic, and even distant Egypt, are using the steam-plow and cultivator with surprising success. From all these countries come reports proving beyond question that, while the steam system reduces the cost of cultivation from 15 to 25 per cent. below that of animal cultivation, the product is largely increased in all cases, and in some as much as 30 and 50 per cent. From the wonderful unanimity which characterizes all these reports, and a careful examination of the whole subject, Mr. Reed is of the opinion that by the general introduction and use of the steam-plow and cultivator the cost of production of the great crop of California, taking the increased product per acre into account, may be reduced at least 25 per cent.

Mr. W. E. Brown, president of the Sacramento Valley Beet-Sugar Company, in a statement submitted to a committee appointed by the society for the purpose of awarding a premium for the best specimen of beet-sugar, gives the product of the factory (1871) with which he is connected as follows:

Value of sugar manufactured, about $110,000; sirup, $6,000; pulp for cattle, $5,000; total $121,000.

The enterprise gives employment to more than one hundred men during the manufacturing season, and nearly three hundred during the season for plowing and cultivating the crop. The sugar produced was equal in all respects to the cane-sugar made by the refineries of San Francisco. The enterprise has also been the means of introducing a new article of food for fattening cattle and for milch-cows; this is the pulp or refuse of the beets after the sugar is extracted. More than five thousand tons of this pulp was fed during this year.

In competing for the premium offered by the society for the greatest number of useful forest-trees planted in permanent plantation during the past year, Mr. James T. Stratton, of Brooklyn, Alameda County, states that he planted the following-named varieties of the Eucalyptus:

Globulus, 8,000; paniculata, 3,000; tereticornis, 3,000; verminalis, 3,000; hemiflora, 300; obliqua, 300; total number planted, 17,600.

These trees cover an area of about seventeen and one-half acres, and at the time the statement was made were in a healthy, growing condition, and from 2 to 4 feet in height. Mr. Stratton states that the seeds from which these trees were raised were imported from Australia. They were planted in July, 1871; were sown in a frame under glass, where they remained about three months, when they were transplanted into

boxes about 6 inches deep and 2½ feet square, (about one hundred in each box,) from which they were again transplanted to a permanent location in April, 1872. The ground was well plowed, and the plants were planted in rows 8 by 6 feet each way, except *E. verminalis*, which was planted in rows 8 by 3 feet. These trees make a total of one hundred and three thousand planted by Mr. Stratton within three years.

The secretary of the society, in his annual visit to the grape-growing regions of the State, spent some time at the vineyard of Mr. D. M. Harward, located in the vicinity of San José. From this gentleman he obtained the following information in regard to pruning the Catawba grape:

Like many other wine-growers of the State, Mr. Harward had concluded that the Catawba grape could not be made to pay for wine, or any other purpose, in California on account of it being so shy a bearer, and had cut down many of his vines of this variety, and had grafted them with other and better bearing kinds, and intended in this way to get rid of them all. Mr. Schindler, who had worked in the Catawba vineyards about Cincinnati for a number of years, protested against this course, and induced Mr. Harward to spare two or three acres of Catawba vines and allow him to prune some of them, with a view to increasing their productiveness. The usual course of short-pruning—cutting back the canes intended for fruit to from two to three buds—had been followed with all the Catawba vines in the field except four rows. These four rows had been pruned by Mr. Schindler after his plan. He cut all the canes of last year's wood, except from four to six of the strongest—according to the strength of the vine—off close to the old wood. These four or six canes left he cut off about three feet long, and tied them loosely to a stake until the spring cultivation was done. He then cut the string and laid the canes down on the ground, spreading them around the body of the vine as much as possible, so that one would not lie upon another. And now for the result. On the vines pruned in the ordinary way we could find but a few scattering, poorly formed, and poorly filled bunches of uneven-sized grapes, not to exceed, on an average, from five to six pounds to a vine, while those pruned as above described were loaded as we have scarcely ever seen vines loaded before. Each cane had thrown outside branches at every joint, and each one of these were crowded full of the finest-formed bunches of Catawba grapes we ever saw. The bunches were compact, long, and full, and the vines would average from twenty to forty pounds each. Mr. Schindler assures us that by pursuing this system of pruning from year to year—cutting off the old canes each year and leaving a proper number of young branches for fruit—the Catawba can be made one of the most prolific bearers, and its fruit much improved for wine purposes.

Dr. W. S. Manlove, of Sacramento County, has practiced this system of pruning the Catawba grape for the past three years, with like beneficial results. He cuts off the head or crown of the vine to within one foot or eighteen inches of the ground, so that the grapes, while growing, lie directly upon it.

Mr. Charles S. Capp contributes an exhaustive article on the subject of the introduction and cultivation of the cotton-plant in California. He says that, notwithstanding all the arguments to the contrary, the successful cultivation of this plant in California has been established beyond contradiction. The numerous theories advanced, occasionally supported by assumed facts, did much to retard, and in many instances to prevent, experiments with the plant, so that its success was for many years after its introduction regarded as extremely doubtful. But facts are much better than theories, and the facts in this case are, that cotton has been, and still can be, successfully and profitably grown in California. It has also been demonstrated beyond a doubt that other fiber-plants, such as the ramie, New Zealand flax, the ordinary flax of the Eastern States, hemp, the maguey, &c., can be successfully and profitably grown here. Speaking of the quality of the cotton produced, and the cost of its cultivation as compared with the cost of its production in the Southern States, Mr. Capp says:

It has been found that the staple produced in this State is superior to the great bulk of the production of the Southern States. That a far larger proportion of any single

crop will be secured in a perfect condition, and, therefore, rate as of the higher grades, than is the case in the Southern States, where the crop is subject to damage by rain Cotton, where it requires any irrigation at all, requires less than half the quantity necessary for the production of Indian corn. The expense of the cultivation of cotton does not exceed that of the cultivation of corn, or other grains which are regarded as profitable crops, while the value of the product is vastly greater. The cost of transportation of a cotton crop is a mere fraction of that of grain of equal value in the market. While cotton, save only in the most exceptionally favorable years, could never be raised in the Southern States for less than 12 cents per pound, here, owing to the smaller amount of labor required in the culture, the cost will not exceed 6 or 7 cents per pound, after land which originally requires clearing has once been reduced to cultivation. The cost of the manufacture of cotton here, owing to our ample and available water-power, will not greatly, if at all, exceed the cost elsewhere, and the difference, if any, will be fully covered in the saving of freight and interest, whether the goods made are for home consumption or export to the markets that lie just beyond our doors.

Of the adaptability of the soil and climate to the successful growth of the plant, the writer continues:

There is no plant, scarcely, that requires so little moisture to grow as cotton, nor for which irrigation is so well adapted. In the Southern States where they have not learned to irrigate the plant, and depend entirely upon the rains that fall, or upon soil that has a deep moist bottom, the crops are very irregular. When planted on a moist soil it requires no irrigation or rain, but should it rain copiously the crop will be damaged and short, and ripen too late, for the reason that too much moisture keeps the plant growing, making wood and foliage, and refusing to boll but sparingly. On the other hand, if cotton is planted on upland and the rains do not moisten it, it becomes stinted, producing bolls prematurely, sometimes not worth the picking. Hence the irregularities—the crops being good on the moist soil and *vice versa*. It is customary to top cotton which is growing too rank in strong or too moist a soil, in order to stop its growth and force it to boll, but such a crop will be always short and inferior. Therefore irrigation is peculiarly adapted to cotton, and when planted on land controlled by irrigation, the exact wants of the plant can be supplied and can be made to bear to its utmost perfection.

The southern counties of California are well adapted to the growth of cotton, where irrigation can be had. The growing season is long, dry, and warm, and the gathering may extend to January. * * * I have found the best cultivation to be to corduroy the ground—that is, to plow the furrows high, like a hog's back, 4½ feet wide, having an irrigating ditch to facilitate the irrigation; after which the dirt is rapidly turned into the ditch, covering the moisture by running a small plow both ways; then a small channel made on the surface of the trench by means of a bull-tongue plow, in which the seed is scattered and covered by the hoe, which is the best way. Great care must be taken that the seed is not planted too deep, for if planted deeper than two inches the plant cannot come up; one inch is the proper depth, and therefore the soil must be well comminuted and in the proper state of moisture to enable the seed to come out vigorously. In order that the seed may not stagnate in the ground, in the absence of abundant rain, the plan is to irrigate and plow in February, corduroy, irrigate, and plant in the middle of March, which will give the plant ample time to grow and ripen its crop. The land being well and deeply saturated with moisture at the time of planting, one irrigation more will be sufficient to mature the crop unless the land to be too porous and sandy. Friable soil is good, but tough and sticky lands are unsuitable. The proper distance for any ordinarily good soil is 4½ by 2 feet. The cost of planting and cultivating cotton is about the same as corn, only that corn requires twice as much irrigation as cotton.

The following is given as the "cotton area" of the State:

	Acres.
San Joaquin County	896,000
Stanislaus County	798,720
Merced County	1,075,200
Fresno County	5,200,000
Tulare County	8,300,000
Kern County	750,000
Los Angeles County	1,500,000
San Bernardino County	2,000,000
Total cotton area	20,519,920

In several other counties the land suitable to cotton-culture is given at what the writer regards as a fair estimate, making the total area in

which this crop can be profitably grown 23,769,920 acres, capable of producing under proper treatment 11,884,860 bales of cotton, of four hundred and fifty pounds each, worth, at the then current price, $775, 493, 640.

Notwithstanding this vast area of cotton-land, it would appear from the following extract that but a small portion of it is as yet devoted to the cultivation of this plant:

From the best information it has been possible to obtain, it appears that the cotton-crop of California for the present year is between eight hundred and nine hundred acres, and that the average yield will be about three quarters of a bale per acre, and probably somewhat more. The staple is fully equal to that produced in former years, and can be sold at 20 and 22 cents per pound. At this rate the product per acre will be from $60 to $80, and in some cases much more, while the expense of cultivation will not exceed that of Indian corn, though the picking is more expensive. The profit to the grower at these rates is greater than can be secured from any ordinary grain-crop on similar land, or elsewhere. Every cotton grower spoken with, and many of their neighbors, were convinced that such is the case, and for that reason declared their intention of extending their cultivation of cotton. All the cotton raised this season might have been planted at least one month earlier, and thus have had one month more of growing weather at the ripening season. The cotton plant has developed no special enemies, and is subjected to no accidents to which other crops are not equally exposed, and as it is not planted until after the character of the season is determined, the risk is less. Its cultivation has many advantages over the cultivation of other crops, while the product is better able to bear the expense of whatever transportation may be necessary to find a market. Cotton is not an exhaustive crop, but will give rise to a useful rotation and a better system of agriculture.

Mr. J. Ross Browne contributes an exceedingly valuable paper on the subject of "Reclamation and Irrigation." As an illustration of the progress of agriculture in the State, he says that in 1849 the actual yield of gold in California was $10,000,000; in 1850, $35,000,000; in 1851, $46,000,000; in 1852, $50,000,000; in 1853, $57,000,000; since which date it has gradually decreased to an annual average product of about $20,000,000. During the years named there was imported from the Atlantic States and South America, most of the supplies necessary for the support of the population. Contrasting this state of affairs with the agricultural products of the past year, Mr. Browne says:

The total value of the wheat, barley, oats, hay, wine, wool, fruit, butter, cheese, and hides produced in California in 1872 is estimated at $75,000,000, of which our exports will probably exceed $50,000,000. The wheat-crop alone reaches about $25,000,000, being an excess of $5,000,000 over our gold yield; and the total of our agricultural products exceeds by about $10,000,000 the entire yield of the precious metals throughout the United States. These astounding results have been produced by the hard labor and individual energy of our farming population, numbering in the aggregate less than twenty-four thousand souls. When we consider that as late as 1860 the total area of land in cultivation was only 937,133 acres, and that in 1871-'72 it reached 3,653,183 acres, our progress seems incredible. And yet how little has been done. California contains an aggregate area of 120,947,840 acres, of which not less than 89,000,000, including swamp and tule lands capable of reclamation, are suitable to some kinds of profitable husbandry. Of these, over 40,000,000 are fit for the plow, and the remainder present excellent facilities for stock-raising, fruit-growing, and all other branches of agriculture. This agricultural area exceeds that of Great Britain and Ireland, or the entire peninsula of Italy. Yet England contains three hundred and twenty-two inhabitants to the square mile, Ireland two hundred and twenty-five, and Italy two hundred and fifty; while California, estimating its population at six hundred thousand, contains only a fraction over three, and of this infinitesimal population five-sixths live in cities, towns, and villages.

In alluding to the necessity of co-operation on the part of farmers and fruit-growers, the writer says:

I have myself seen wheat selling for 100 per cent. more than the farmer got for it; wine retailing at the hotels in San Francisco at $1.50 a bottle, while it sold at Los Angeles for 40 cents a gallon or 8 cents a bottle; grapes sold at 8 and 10 cents a pound, while the producer got only 75 cents a hundred; and fruit thrown into the Bay of San Francisco because the fruit-dealers could not get rid of it fast enough to keep it from rotting, at 5 cents a pound, while the fruit-growers would be glad to sell it at

$30 a ton. It is said that these things always regulate themselves. Now I question if anything regulates itself. The farmers, viniculturists, and fruit-growers must combine for their own protection, as the grain-dealers and hucksters combine for their own profit, otherwise they will continue to labor for the benefit of those who, however useful as a class, produce nothing.

The writer then gives the number of acres of swamp and overflowed lands in the State susceptible of reclamation at moderate cost, their probable yield per acre, and the estimated income therefrom per annum. He says:

According to a late report of the surveyor-general of California, there are about 3,000,000 acres of swamp and overflowed lands in this State. If these lands were all reclaimed and under cultivation, they would, in his opinion, produce more for a given number of years than all the rest of the land in the State together. To his personal knowledge 80 bushels of wheat to the acre were raised on reclaimed swamp land in 1871, and he considers it safe to say that the average of the whole, if cultivated, would not fall short of 50 bushels per acre.

I am inclined to think that these estimates are somewhat too high. We should bear in mind that the whole of any particular tract cannot be equally well cultivated; that there are local peculiarities in the soil and climate—intervening sloughs, sinks, and gaps, heavy winds, and other adverse contingencies—which, under the most favorable circumstances, would tend to reduce the average. While the highest average product of wheat in California, taking good and bad lands together, has never exceeded 20 bushels to the acre, it is gratifying to know that this exceeds by 7 bushels the average product of twelve of the best wheat-growing States in the Union; and I find by reference to late Australian papers that the average in that region is not over seven bushels.

Good valley-lands in California produce about 30 bushels, reclaimed swamp-lands from 35 to 40. Assuming the lowest figure to be within bounds, 3,000,000 acres swamp-land thoroughly reclaimed and cultivated would yield 150,000,000 bushels. Deduct for cost of plowing, seeding, and harvesting $10 per acre, and we have a net result, at 1½ cents per pound, of $38,250,000, or very nearly double our entire gold-product.

Mr. Browne says that, properly speaking, there are three classes of land in California subject to overflow—the tule-lands bordering on lakes and rivers; the low alluvial valley-lands; and the salt-marshes bordering on the shores of bays and estuaries. The tule-lands derive their name from a species of gigantic rushes which grow upon them, forming a mass of roots and fibers that contribute mainly to the growth of the land itself. For centuries past, these tules have been burned off by the Indians in the dry season while in search of game, and the accretions formed by the roots, mingled with the ashes, together with the deposits of soil carried down from the uplands, have gradually caused them to rise above the level of the ordinary water-surface. In seasons of flood, or by the action of the tide where it prevails, they are of course submerged unless protected by levees or embankments. The principal portion of the tule-lands of the State lie along the shores of Kern, Rio Vista, and Tulare Lakes south, extending thence northwardly in a belt along the San Joaquin River as far as their junction with the tule-lands of the Sacramento, which commence above Red Bluff, following southwardly both sides of the Sacramento River till they form the great delta into which the two rivers are united.

The writer regards these lands as better adapted to the production of grass than any other crop. He says:

I am inclined to the opinion that the tule-lands of the delta are more suitable for grazing purposes than for the growth of wheat. And I believe they would be ultimately more profitable bearing from five to eight tons of alfalfa, timothy, or blue-grass annually per acre, than they could ever be under permanent cultivation in wheat. Doubtless they will produce jute, ramie, flax, hemp, and various other textiles, but their great value consists in the fact that they are naturally the best meadow-lands in the world. The experience of Holland shows that there is sufficient profit in the production of good meat, butter, and cheese to make a nation rich.

As an illustration of the wonderful productiveness of these reclaimed lands, the following results of actual experiments are given:

Twitchell Island, in the delta of the Sacramento and San Joaquin, was purchased by a Kentucky company, who paid for 3,000 acres $25 per acre. By the simple process of burning the tules, scattering the seed in the ashes and tramping it in by running herds of sheep over it, they planted 1,000 acres, which gave them a gross yield of wheat amounting to $36,000. Had they planted the whole tract it would have yielded them, at the same rate, a surplus of $33,000 over the entire cost of the land. As high as 75 bushels to the acre was produced on particular parts of the tract, and wherever a fair average test could be made the product was from 40 to 50 bushels.

On Sherman Island, some of the lands cultivated in wheat yielded a profit of $30 to the acre, and the average was not less than $25. Personal observation and the concurrent testimony of farmers residing on the island satisfies me of the truth of these statements. In one instance brought to my attention a fourth interest in the crop yielded $16 an acre, and the land is now under lease for a third interest.

At the Mormon settlement in the Sacramento Valley an average yield of 40 bushels to the acre was produced during the past summer. Part of the land cultivated yielded as high as 60 bushels an acre. Where crops can be irrigated during the summer, as will eventually be the case on all the swamp-lands throughout the State, the annual product will be greatly increased. Two or three alternate crops of different products will not be unusual in a single season. The yield of these moist lands in alfalfa, timothy, and the various grasses, is enormous. Five tons to the acre is considered an ordinary crop, while as high as eight tons in a single year is nothing uncommon. At $15 a ton a very handsome profit can be made from hay, allowing one-half for expense of cultivation, baling, shipment, &c.

In answer to the question often asked, as to the sources of increase upon which capitalists can depend for dividends on these reclaimed lands, Mr. Browne replies as follows:

Good valley-lands in California produce about 30 bushels to the acre; reclaimed swamp-lands from 35 to 40. Assuming the lower figures to be within bounds, 3,000,000 acres of swamp-land, thoroughly reclaimed and cultivated, would yield 105,000,000 bushels. Deduct for cost of plowing, seeding, and harvesting $10 per acre, and we have a net result, at 1½ cents per pound, of $38,250,000, or very nearly double our entire gold-product—a pretty good source of income.

Experiments are now being made on Twitchell Island in the cultivation of ramie, jute, China grass, and Japan hemp, for which the soil and climate seem to be peculiarly adapted. Ramie and jute give a net profit to the acre of from one to one hundred and fifty dollars annually—enough to recompense the investment fourfold. The large scale on which these experiments are being made will furnish a satisfactory test during the coming season. Ramie is a perennial plant, and semi-aquatic. Its value as a textile has no equal. The jute is next in importance, and furnishes material for our wheat and wool sacks. This plant is sown like wheat, either in drills or broadcast, and matures in from ninety to one hundred days. The price of jute in the United States is about half that of cotton. There is a duty on the raw material of 30 cents; manufactured, 40. Our tule-lands will produce it at a less expense than in India, where the advantage of cheap labor is more than counterbalanced by our labor-saving machines. We will require on this coast, for many years to come, from three to five million dollars' worth of burlaps. It can as well be grown here as in India, thus saving freight and duties; and there is nothing to prevent us from manufacturing all we can produce.

Speaking of the importance of a complete system of irrigation, and the advantages to be gained thereby, the writer says:

Irrigation is necessarily and inseparably associated with reclamation. It would be of comparatively little use to reclaim from overflow the swamp-lands of the Sacramento or San Joaquin Valleys without providing at the same time an efficient system of canals and ditches for irrigating them during seasons of drought. The lowlands have an advantage in retaining their moisture to a later period in the season than the uplands; but experience shows that their productiveness is materially affected by drought, and that no reclamation is perfect which does not include the means of irrigation. The swamp-lands in the delta of the Sacramento and San Joaquin are very favorably located in this respect.

There is no antagonism between the two great schemes to which public attention is now invited—reclamation and irrigation. On the contrary, the success of one will materially benefit the other; and we have the most incontrovertible testimony that nothing adds so certainly and so largely to the wealth and population of a State as the two combined. * * * The San Joaquin Valley has been open to settlement for more than twenty years; and yet, with an area of six or seven million acres of land, capable of producing enormous crops, the total population engaged in the cultivation of the soil does not exceed two or three thousand. Of the lands susceptible of

profitable cultivation by means of the proposed system of irrigation there are at least 3,000,000 acres, capable of producing 30 bushels of wheat to the acre, and adding clear of all expense from fifteen to twenty millions of dollars annually to the wealth of the State. But this is by no means the only source of profit to be derived from such an enterprise. It attracts population and insures settlement; it builds up towns and villages; it establishes trade and manufactories; it furnishes a constantly augmenting necessity for an extension of railroad systems; it encourages better systems of agriculture by the introduction of new staples, and more profitable employments for all classes of labor; it adds to the taxable value of property, and increases the revenues of the State; in short, it promotes in every point of view the great cause of civilization.

Mr. Ekin Smith contributes an article on the subject of the choice of lands for vineyards, from which the following extracts are made:

I purpose to confine myself to the consideration of vineyards for wine-making rather than for market-grapes, since the value of grapes for the market is governed more by size and appearance than by inherent qualities; and the very circumstances which produce size and fine appearance are often detrimental to the wine. For the market it is rather a question of convenient transportation, for almost any locality in the interior of California can be made to produce fine market-grapes. Not so for wine. First-class localities are comparatively scarce and the area limited. Without doubt any vineyard can be improved by cultivation, but unless the physical aspect and chemical properties of the soil are favorable, a first-class wine *cannot be produced.* A soil rich in decomposed organic matter will often produce grapes of fine appearance, but the wine *will* have an earthy taste. This fact alone excludes almost all bottom lands from the list of good localities. Sands have not this objection, but are nearly destitute of mineral salts, and therefore cannot produce a high-flavored wine.

But the greatest of all evils is an undue quantity of potash, and this objection lies against nearly all lands not having sufficient drainage, and many hills whose bed-rock is composed largely of feldspar. Common feldspar contains from 12 to 15 per cent. of potash, and enters into the composition of many of the rocks of our foot-hills. Granite, gneiss, and mica slate contain about 40 per cent. of feldspar, which decomposes on exposure and sets free the potash. Where the hills are steep and the drainage perfect the evil is not so great, as the potash passes off in a soluble condition. Potash is an element of fertility, and grape-vines absorb it largely, thrive and produce abundantly with it in excess, but its effect upon the wine is pernicious. One of the prime essentials of good wine is tartar, and where potash is also present in solution, they readily combine and form a salt which is deposited on the sides of the casks. From this salt tartaric acid is made, instead of remaining in the wine, and we wait in vain for a fine flavor to be developed; it is neutralized by the potash. Lime is also an alkaloid, but having great affinity for carbon, is generally found as a carbonate; and while it is not desirable in excess to make a still wine, is indispensable to make a first-class champagne, from the large amount of carbonic acid which it affords.

Soils having a substratum of magnesian rocks are not open to these objections, for although magnesia is an alkaloid, it is not soluble in water, and not known to enter into the composition of plants; but it is less fertile, and vines do not bear so abundantly. All lands having a subsoil of clay are objectionable; the roots will not penetrate it, and the vines are liable to suffer from drought, and generally containing too much potash, as the clay is decomposed feldspar.

ILLINOIS.

Horticultural.—The proceedings of the eighteenth annual meeting of the Illinois State Horticultural Society for the year 1873 are contained in a well-printed volume of 350 pages. The annual meeting was attended by the leading horticulturists of the State, a majority of whom took part in the discussions which followed the reading of a series of able essays prepared for the occasion.

Mr. M. L. Dunlap, president of the society, in his opening address, called attention to the great destruction of fruit-trees during the past winter and spring. Among other causes which he thought contributed to it, he mentioned the unusual drought of the past three years, the abundant crop of fruit in 1872, which necessarily weakened the vitality of the trees, and the unusual severity of the winter which followed. He said:

Formerly we had been taxed with a surplus of rain-fall—that called for drainage—and now we have the very reverse. The wet feet which occasioned so much of our attention have become dry feet, and that excess of dryness, like the excess of wet,

has led to death in the orchard, the vineyard, and on the lawn. We must not speculate on the cause of the changes in the progress of the season, but may look to the effect and inquire for a remedy. Fortunately the plan for the cure of the one is also a cure for the other. Deep tillage and a friable condition of the soil is essential to both conditions. In one case the rain-fall may pass off through the soil, and in the other it may arise by capillary attraction.

Mr. Gove Wright, a member of the society from Whiteside County, contributes the following:

The horticultural record for the year 1873 will, I think, show greater disasters to trees and fruits than any written since the organization of this society. The three previous years of continued drought had exhausted the earth of moisture below the reach of most fruit, ornamental, and forest trees; the little rain we did have only stimulated an unnatural and excessive growth of surface-roots, which, like any surface-watering of plants in summer, rendered the trees unfit to endure the severity of last winter's frost, or the drought of the present summer. These surface-roots were, in many instances, killed, while the lower roots, as well as the trunks and branches, were uninjured; but as those lower roots were situated in dry earth they could furnish no sap to sustain the life of the tree, and consequently, after putting forth a feeble growth of leaves, and perhaps blossoms, from the sap stored in the trunk, it withered and died. Perhaps my explanation is not very clear, but to my mind it is sufficient to account for a singular fact which has been observed by many farmers in this vicinity, viz: That in one part of an orchard the "hardy" as well as the "tender" varieties were all killed, while in the rest of the orchard, which was equally exposed, only the tender kinds were injured. I have cut scions from several trees in the spring, and, while all the scions grow finely, the trees from which they were taken soon after died. So far as I can ascertain, the part of an orchard which was killed had a dry subsoil, while that of the balance was more moist. It will be seen that the condition of a tree with its surface-roots killed and its lower roots in dry earth would be like that of a cutting placed in dry soil and watered on the surface.

It will not do to call a tree "tender" because it was killed under such circumstances, for the reason that the past winter was no real test of hardiness, except of those varieties which were universally killed by exposure. I cannot discover that screens or timber-belts have been of any benefit to orchards, while the fruit-trees standing near a hedge, or a row of willow, poplar, or maples, have suffered more from drought than others. I have observed that all the orchards in this vicinity which were planted over a hill have lost all the trees on the southern slope, while those on the north side of a hill were vigorous and healthy.

Mr. L. K. Scofield, of Stephenson County, communicates a similar statement. After stating that he has found but one case of general destruction in old orchards, he says:

One orchard, twenty to twenty-five years old, on the prairies, six miles west of Freeport, which had been used as a hog-pasture and was entirely destitute of vegetation and nothing left on the surface as a mulch, was entirely killed, with the exception of the south row standing near the fence where the snow drifted in, remaining all winter and serving as a protection to the roots. This row appeared all right in July. The trees in the rest of the orchard blossomed as usual in the spring, but did not put out a leaf. My opinion is that had this orchard been well mulched in the fall, so as to protect the roots from the severe frosts, it would have been saved. The frost penetrated to the depth of four to five feet, as proved by digging in various places during the latter part of winter. In no case or situation was it found to be less than four feet. The fall of snow during the winter was light, not sufficient to afford much protection from the extreme cold. I will cite another case: In the north part of the county, twenty-five miles distant from the former, an orchard on the prairie sloping to the north, which had been used for the same purpose and was apparently as devoid of vegetation in the fall, showed no signs of injury, and at the time I visited it, in August, looked vigorous and healthy and was well loaded with fruit. This orchard was about fifteen years old and the trees branched low, while with those of the other orchard it was the reverse.

He further states that in many orchards he occasionally found a tree killed by the winter, irrespective of variety or location. Hardy varieties, as a general thing, suffered equally with the more tender sorts. In all cases where a personal examination was made he found the damage in the roots, which had the appearance of trees that had been exposed in the open air to the action of frost and heat. Similar statements were made and received from almost every section of the State, showing that

the destruction of fruit-trees was general and confined to no special locality.

Mr. W. C. Flagg, from the standing committee on ornamental and timber trees, read a very interesting paper on the subject of the conditions of tree-growth. He states that the census returns of 1870 showed that the State had 14.1 per cent. of its surface in some kind of tree-growth; that Northern Illinois had only 7.5 per cent. of woodland, while Central Illinois had 10.8 per cent., and Southern Illinois 23.7 per cent. From returns received during the year 1873, from all the counties of the State, save those of Kendall, Greene, McLean, Marion, Perry, Pulaski, Williamson, and Hardin, he shows a very satisfactory increase in the area of woodland, as follows:

Acres of woodland in 1873, 6,289,236; in orchard in 1873, 320,702; acres of woodland in Kendall, &c., in 1870, 452,137; total, 7,062,075.

This shows an increase of 6 per cent. in three years, giving at least 20 per cent. of the area of the State as woodland of some kind.

In the course of his article Mr. Flagg thus speaks of evergreen-trees for timber:

We have three natives of our State that have proved themselves capable of enduring our climate, and, at least, some of our soils from youth to old age and large size; these are the white pine, the red cedar, and the cypress. The white pine, of which there are, or at least were, large, old forest-trees at Rockford, has done more to "build up" America than all other trees. It has a wider natural range of climate and accommodates itself to a greater variety of soils than any of the lumber-furnishing trees of the northern forests. The red cedar, according to Gray, has the greatest climatic range of any woody plant in America, (from Middle Florida, at 26°, to latitude 67° beyond the Arctic circle.) It is the one evergreen that the drought of the plains cannot kill. "In the dry climate of Texas and the Dakota region it becomes a prominent tree, covering large tracts where scarcely any other will grow; and in the Comanche, Wasatch, Yellowstone, and adjoining regions, it becomes over vast districts the only tree-growth, and therefore of great importance. On the bluffs of the Platte, Missouri, Canadian, and other rivers, it appears with trunks three or four feet thick, which, judging from its slow growth, must be of immense age." It thrives in a great variety of soils. These occur only where bluffs, bare rocks, or gravelly land have stopped the spread of fires, but serve to show that this useful tree might, if protected from them, be made to grow on many parts of the now treeless plains. On the islands of the Platte, thus protected and in good soil, it attains its highest development, the dry climate seeming well suited to it. Showing that it requires summer heat rather than moisture, we find it growing at the east base of the Rocky Mountains, in latitude 51°, while along the Atlantic it reaches only to latitude 43° in Maine. North of these limits a low, shrubby form takes its place, considered by some identical, and reaching latitude 67° on the Mackenzie River. The deciduous cypress is limited more in its range northward, but in Southern Illinois grows finely, and within its range grows well on dry land, and endures drought and heat with serenity.

Mr. A. G. Humphrey read a paper on the subject of the exhaustion of our forest and timber trees, which elicited considerable discussion. Prof. C. V. Riley, of Missouri, being present, took exceptions to many of the writer's statements. He said there was no lack of forests in the older Eastern States nor in the State of Illinois; however much the planting of trees may be desirable, he was satisfied there were more trees growing to-day than there were twenty or thirty years ago. He continued:

Take the Atlantic and Pacific Road, if you will, and see the immense amount of timber that is growing everywhere. I cannot see, for the life of me, after examining this question very candidly, that forests affect the climate a bit. We talk about the drought of a few years past having been induced by the want of forests. Why not say that the wet seasons we have had were the result of the same causes? I believe that every field that is plowed is a far better conductor of moisture than trees. Mr. Meehan claims that there is less water in the ground under forests; that the water runs off more easily when covered with forests than it does when plowed and tilled. I think, if you will look at meteorological tables, you will find that just as excessive droughts must have taken place in years gone by, when the timber must have been

more plentiful, as takes place now. In some of the States, where timber is being cut all the time, regardless of consequences, there is some chance of their not having the same supply they had before, because "it is difficult to grow the same kind of timber after it is once cut down;" but that we may lack for timber in the next century is what I do not believe. While I would have trees planted for ornamental purposes, for use as timber, and for fruit-culture, still I do protest against thus making us fear for the future.

Mr. C. W. Greene thought Professor Riley decidedly wrong in supposing that the supply of timber would hold out any considerable length of time, especially in the Southern States, at the present rate of consumption. He had had experience in gathering timber through a portion of that country, from Columbus, Ky., to Mobile, Ala., a distance of four hundred and seventy miles. A few years ago this country was covered with fine forests, but to-day there was scarcely a timber-tree left upon it. At the close of the war he had occasion to rebuild one hundred and fifty-five miles of railroad through this country—a road which traversed the most magnificent timber country he had ever seen—but to-day these fine trees have all disappeared, and ties for the same road have to be drawn a distance of from one-half to a mile. As to the effects of forests on the soil, he said:

If Professor Riley will ride over any of the Southern States and notice the condition of the land where the timber is taken away, he will see it entirely exhausted, and the result is that the farmers are turning out their old lands, and clearing new lands to use in the same way. Then, again, these old fields are washing into gullies, and getting into such a condition that it will be impossible to restore them. Now, take the southern yellow-pine region. We know that it is being exhausted very rapidly, that mills have been torn down and moved, denuding one section after another until you can scarcely find any timber within a reasonable distance of the navigable streams or rivers. Certainly there is as much danger, or more, in exaggerating the actual supply as there is in underestimating the quantity for use hereafter.

In reply Professor Riley stated that he objected to the essay, because it brought forth only one set of facts. While he did not deny that timber-raising will become profitable in years to come, he did deny that there have been any effects of a broad enough character to warrant the belief that the denudation of forests, as it has gone on for the last two hundred years, has had one particle of effect on the climate. If anything, he thinks the climate has been improved in the Western States, and has grown no worse in the Eastern States.

After stating that the question was not in regard to the amount of rainfall, but whether the extremes were not greater now than when forests were more abundant, Mr. W. C. Flagg said:

Now, there is a certain amount of cold that you may throw out of consideration, that is, so long as it does not affect vegetable growth. When you get below that it will be important to look into it. I am perfectly willing to admit that the same causes that one hundred years ago produced a certain amount of rain-fall will do the same now. But I think the extremes are greater. Our apple-trees have been damaged more by excessive rains and succeeding droughts than was the case fifteen or twenty years ago. I think for the last ten years the maximum cold for January has been greater than for any other series of ten years. Last winter we had the cold at minus 27°. In 1864 it was minus 25°. These points were not reached at any time back of that, unless it was in 1831 and in 1856 and 1857. There are three periods, almost of ten years, in which there has been intense cold. The same holds true of heat. There has been a greater variation between the extremes, while perhaps it did not affect the means. * * * I made a translation year before last of the observations made by Mr. Matthieu, of Nancy, France. He measured the rain-fall at two points six miles apart; one in an almost treeless farming country, and the other in a small opening in a large, dense forest. The result of his observations for two years and eight months showed a difference of several inches of rain-fall in favor of the forest. The experiment was tried, for the same time of measuring the rain-fall directly under the trees; and it was found that even there, beside the amount held by and evaporated from the leaves and bark, there was more rain reached the surface of the ground than in the open ground at the distant station. Then the evaporation in the open location was four or five to one. Now, while forests

may not have an effect on rain-fall, taking the country at large, yet they do have an influence. In these cases I think Mr. Meehan would acknowledge that the forests gained at the expense of the open ground. That is very likely true; but as to evaporation, I have no doubt that forests have a direct effect. That, to my mind, is a great argument in favor of tree-planting in this country.

Mr. H. H. McAfee followed, and replied at considerable length to the views contained in the article alluded to by Professor Riley from the pen of Mr. Meehan. After dissenting *in toto* to the arguments presented by the last-named gentleman, he said:

Suppose a piece of original forest-land, just as it was in a state of nature, with the ground only disturbed by such wild beasts as pass over it occasionally. First, the condition of that forest, with the leafy screen overhead, was such that just beneath the heads of the trees was a stratum of air, inclosed and kept quiet. The rapid-flowing winds outside could not pass through this forest. Secondly, the moisture was longer retained there than on the open land. All know that during the season of vegetation our deciduous trees are giving off moisture at a rapid rate. Tons are being thrown into the air. The air is continually obtaining moisture from these trees, and will any one say that they have not an effect on the atmosphere in the way of moisture?

Under the damp atmosphere lies what? The *débris* from the trees—fallen leaves, particles of shedding bark, &c., undergoing a slow decay. When a drop of water falls there, it is held as in a sponge, indefinitely soaked out, absorbed, evaporated, or filtered through it. That being the case—the decaying verdure being a layer of sponge to contain water, and the atmosphere being charged with moisture above—these two things will quickly show any one why that country is damper in its atmosphere and surface than it would be without that forest. Now let us go downward. Some rain falls upon that forest, and some finds its way to the spongy mass of earth, and is retained for a while, and gradually goes down, down, down. You may say that the moisture passes into the roots of trees so much that it leaves the soil dry. How does it get into the roots of trees? There is a principle involved there—a very fine one, too. The roots are not open mouths, sucking up moisture out of the earth; they are closed cells, with no opening to be seen in them, and the moisture that passes into them passes in on the principle of osmose absorption, and that tree will not remain turgid, and in the highest condition of health unless there is moisture in the earth to absorb.

That osmose absorption ceases, to a certain extent, whenever the amount of moisture falls below a certain point. We can find forests in such a condition that in many places the soil is powder-dry. These are suffering for want of moisture; and if you ever dig down into the forest, and find the soil dry and dusty where the roots are, that forest is suffering. Under these circumstances just one thing must happen: the moisture which goes into these trees, and which is essential to their healthy growth, and even life, must ultimately all come from the atmosphere. Whether the tree takes it from the earth through the absorbing root-surface, or directly from the air through leaves and bark, it still must come from the air as rain or dew, or as invisible gas. And as the presence of these trees necessitates a greater supply of moisture from the air than would be necessary for an herbage crop, so if trees live and thrive, their very existence proves that a larger sum of moisture is being deposited from the atmosphere at that point than would be deposited were they absent.

The remark has been made that vegetation does not fix water. Surely this is an error. The growing plant is but a laboratory, wherein the inorganic simples are worked over into organic compounds, or where the inorganic compounds are broken up and recombined under the dominance of that mysterious principle, the vital force. Trees are making cellulose, lignine, starch, sugar, oil, resins, gums, &c., in which are the elements carbon, hydrogen, and oxygen. The carbon is derived from the carbonic acid gas of the atmosphere, while the hydrogen and the oxygen come mainly from the water. Here, then, in the wood, bark, and the various products of the vegetative function, the tree has been fixing water as a part of some organic solid. The water which is given off in the combustion of any organic substance, has once been made water before, and such combustion may be regarded as the undoing of the work which the vital force has done. Considering the part which the moisture of the atmosphere must take in all forms of vegetation, how can we say that the larger plants, such as trees, have "no appreciable meteorological influence?" They must absorb and they must excrete immense volumes of water, else the economy of their circulation, upon which their life depends, would be destroyed. They must use a great deal of water as an ingredient of the substances which make up their mass; and all this water must come from the atmosphere. In the life-story of a tree is found, then, a better argument for the meteorogical influence of forests than you can fine in your rain-gauges.

Mr. E. C. Hatheway, from the standing committee on vineyard-culture, presented quite an elaborate report on the progress and condition

of this interest. He places the Concord grape first on the list for hardiness and general good qualities, the Perkins second, and the Clinton third. The Perkins is comparatively a new grape, but has proven itself hardy and a most prolific bearer. As compared with the Martha, he considers the Perkins better in every respect, being earlier, a larger berry, larger clusters, not having any more if as much foxiness, while it possesses the merit of being absolutely hardy in every situation, without any protection. As to the profits of grape-culture, Mr. Hatheway says:

There is no doubt in my mind that 5 cents per pound will pay for Concords where good culture is practiced, as this variety is capable of producing on an average, annually, fully twenty pounds per vine, without detriment or injury to it. Reckoning six hundred vines to the acre, planted 8 by 8 feet apart, each vine carrying six canes, trained to wire trellis, each cane 5 feet in length—thus planted, pruned, and trained, the Concord will produce, at the above price of 5 cents a pound, $680 per acre. Allowing $200 as interest on original investment, which is ample, and $100 per annum for cultivation and other expenses attending marketing, &c., leaves $380 net per acre. Where is the land farmed in corn or other products that will produce any more?

A protracted discussion occurred on the subject of the failure of the fruit-crop in 1873. Mr. Flagg called attention to a report made to the Warsaw Horticultural Society in relation to an apple-orchard, part only of which was in blue-grass. It was found that the trees which grew in blue-grass were not killed, but came through in tolerably good condition, while those in cultivated ground were killed. It was also stated that at Momence and elsewhere trees that were in grass were found to be doing better than those that were not, and in those cases the earth was several degrees cooler than where it was bare or under cultivation. Mr. Galusha also alluded to this report, and stated that in the discussion upon it the committee said they examined the trees that were killed, by digging down, and they found on the south side of the tree where the sun shone, that the roots were dead, while on the north side they were not. They attributed the injury and death of the trees to the fact that the soil was heated and became too hot and dry during the last extremely hot summer, and thus prepared the way for the death of the trees during the succeeding severe winter. In the blue-grass they also dug down to the roots and found them uninjured. Admitting this to be a fact, he cautioned fruit-growers against laying too much stress on blue-grass, as such a summer, followed by a like severe winter, might never again occur, and to put orchards in grass and get stunted trees would be bad policy. Mr. Minkler said that the injury to the trees was attributable to the excessive drought and dryness of the soil after a heavy crop of fruit. The trees had exhausted all the moisture and there was nothing to sustain them in the winter, and the excessive frost then coming on killed them. Those that had borne the heaviest crops were most exhausted. In reply to a question as to what caused the death of trees in the nursery, which had never borne fruit, Mr. Minkler said that one variety may have gone to rest early and another variety may have held on growing until late. The early Richmond went to rest early and came through safe and sound, while other varieties going to rest late exhausted the moisture and were killed. Mr. Wier said:

In hot, dry seasons, our trees do not grow thriftily, and after them they are more liable to winter-killing, which we attribute to the severe drought. *Per se*, of course it is the primal cause, but the drought alone, unless much more severe than we have ever experienced, would not cause such disastrous results. We must bear in mind that our long, hot, dry summers are very favorable to the generation of many minute noxious insects, particularly leaf-destroying ones, as well as other animal, sporadic, and fungoid life; those preying upon the leaves at the most critical time, (July and August,) send the tree into the winter in a feeble, impoverished condition, particularly its

roots. In such dry and hot seasons the leaves of our trees swarm with leaf-hoppers, leaf-lice, (or *aphides*,) and very often with millions of leaf-feeding mites, or *acari*. I have seen a young nursery of tens of thousands of apple-trees without one perfect leaf on them during July and August, from punctures of leaf-hoppers, which puncture the leaves with their beaks, suck their vital juices, and by their wounds entirely destroy the digestive organs of the leaves. The *aphides* injured them in the same way. Of *acari*, or mites, that feed upon leaves, there appear to be hundreds of species, all closely allied to the so-called red spider, so well known in green-houses; these appear to feed entirely upon the under cuticle of the leaves, which is, as is well known, the most vital part; they not only gnaw away and destroy the under portion of the leaves in patches, but appear to smother and destroy the rest by covering it with a thick spider-like web. These mites are almost microscopic in size, but as they swarm in countless millions, the effects in a dry summer are very appreciable. They not only do great damage themselves, but their wounds and punctures form *nidi* for the spores of destructive fungi of various kinds; these, in their peculiar seasons, spread with the greatest rapidity, and quickly destroy any vitality that may be left in the foliage, and it falls to the ground leaving our fruit-trees as we often see them, entirely bare of foliage early in August. What chance is there for such a tree, be it ever so hardy, to pass safely through our severe winters? Why should not such a tree be dead in its roots the next spring, even if there was no severe winter? To have good roots we must have mature, fully organized leaves to build them up—no leaves, no roots; weakened leaves, weak roots.

Professor Riley thought the meteorology of the last few years had a great deal to do with the destruction of the trees. Excessive heat and drought had been experienced for two or three years, and notwithstanding an abundance of rain fell last spring, it was so violent that it penetrated the ground but little. Three or four feet down there was not a particle of moisture. Wherever the cultivation of vineyards had been neglected the grounds became baked, and the vines greatly suffered from drought. He was satisfied that the excessive drought and the severe winter which followed were the chief causes of failure. Mr. Flagg said that the summer of 1870 had some very severe drought in it; that it was continued through the fall and winter and into the following spring—an excessively severe condition of things. The summer of 1871 did not make up the deficiency of moisture, and the same thing was continued through the winter, and into the spring of 1872. Following up this great drought, and the second great bearing which left the trees in a very enfeebled condition, was the excessive cold of last winter. Mr. McAfee thought one branch of the subject had been neglected. If any force is brought to bear on an animal or plant that is against it in nature, that animal or plant, to resist to the best possible point, should have its full vigor, and its full powers of life and resistance; and if that plant is in any way weakened or enervated by anything that has happened to it recently, it is incapable of undergowing this stress. He continued:

Now look at our seasons for a few years past in Northern Illinois. We shall find that for three years past it has suffered from droughts, especially last fall, and especially during the latter part of the season, when the buds were being perfected, when the stores of plant nourishment were to be laid away—just at the time when the plant was in a flaccid, drooping, weakened condition. There was not water enough to make its leaves soft, and there were not juices sufficient to produce the starch which must be laid aside for plant-food. Perennial plants lay away the food in late summer and fall to start in the spring; and if you cut them off early from all sources of nourishment, they will grow for awhile in the spring, perhaps, but not long; they must have that food laid up. Trees in a condition described could not possibly store this food, as the osmose work, which is going on from cell to cell, if there was not turgidity enough in the plant, could not take place properly; the starch granules could not be born, and therefore, the plant would die. The roots were quite dry and solid until the frosts of winter came; there was not a particle of mud to impede the running of wagons in our section of the country. I believe right there lies the cause of the trouble last winter. It was a different thing to killing plants by excessive freezing; 40° below might have killed them, when 28° would not; but 28°, when the plants were in such a condition, would be enough to kill them.

During a discussion on the subject of small fruits, Mr. McAfee stated that the tree-cricket was becoming very troublesome to cultivators of raspberries in his section of the State. It bores the canes from one end to the other, and fills up the orifice with eggs. The Philadelphia raspberry was regarded as the best berry for profit, but as there is a spurious variety in market, cultivators were cautioned against purchasing canes from any save well-known and reliable nurserymen. The Turner raspberry was highly recommended by Mr. Galusha and Mr. Nelson. The berry is as large as the Philadelphia, but not so firm, and consequently not so good for market purposes; but for family use it is all that could be desired. The Clark raspberry was regarded as a failure by Mr. Galusha, who had plowed up his vines and planted other varieties in its place. Of the Herstine raspberry, Dr. Furness said it was the most valuable and desirable variety he had ever grown. The color and size of the berries are similar to the Philadelphia, but it is even more productive than that variety. For a large-sized berry he stated that he had never seen its equal.

Professor C. V. Riley read an interesting paper on the subject of entomology, the concluding portion of which was devoted to an explanation of the habits and depredations of the grape *Phylloxera*. After alluding to former researches, he said:

Last fall Professor Planchon spent a month in this country, and all my previous conclusions were verified by what he found here. First of all, we have on the leaves of some of our varieties of vines, especially on those belonging to the *Riparia*, a gall or excrescence, on the under side of the leaf, which sometimes covers the leaf. If we examine them we shall find that there are a great number of pale-yellow eggs in each, with a dark-yellow mother-louse. Sometimes you will find not less than a thousand of these eggs in a single gall. Every one of these produces a louse. Each one of these lice is a female, and is capable of forming new galls by puncturing the leaf with its proboscis. The young louse crawls and forms a new gall without impregnation. It increases until it becomes like its mother in size, and is soon surrounded by five or six hundred or a thousand eggs. Now, if from a single mother-louse a thousand eggs are obtained, in five generations the number of lice will foot up one thousand billions of individuals.

This gall form is but a transient form. Three or four years ago it was most abundant, especially on the Clinton; last year it was more on the Taylor and Delaware than on the Clinton. This year it has scarcely been seen. As I said, it is only a transient form, the true being the root form or *radicicolsa*. On the roots they collect in little companies, and cause by their punctures, not galls, but swellings of the roots. The moment the lice have done their work and begin to leave, these swellings will shrink up and the roots decay and fall off. So it is with the large roots, and the lice we find on the roots are always tuberculous. The gall-inhabiting form exists only in the wingless female sex; but on the roots, about as early as July, you will find winged individuals appearing. This root form presents us with individuals of both sexes. In the male the body is shorter than in the female. In July, and all along after then, they are becoming winged insects. These insects spread over the ground—wingless and winged—they also crawl along the roots under ground. The winged female is always burdened with from three to five eggs. These few eggs are probably deposited in the fuzzy matter of the vine. So that you see the insect can be transported either in new vines or on cuttings. This will explain how it was introduced into France some ten years ago, or perhaps longer. The winged insect also flies, and deposits eggs in neighboring vineyards. * * * While the insect is on the small roots the evidence of their work is less conspicuous, but as the roots waste away the symptoms become more acute, and at this stage of the disease the lice have generally left. A small number of root-lice produce no serious effects on the vine; it is only when they are numerous and cause not only the fibrous roots, but even the large roots, to waste away, that the disease becomes serious.

As a remedial or preventive measure I have urged grafting of the more tender varieties on roots of those that are stronger. Most of our native varieties are strong, and the tougher-rooted varieties resist the puncture of the louse more than the others do. * * * The disease is in the form of little cancerous spots which cause the spots to rot. You may imagine how little the true nature of this disease is understood when I say that, notwithstanding all that has been written for the last three years, thousands and thousands of francs have been spent in France to find a remedy. I am happy to

say that we now have what we think is a remedy—this is the bisulphide of carbon. This remedy, so far, has proved effectual in killing the lice. It is a very volatile liquid, and is put in three or four holes around the vine. The holes are stopped up rapidly, and the vapor from it carbonizes the insect and does not hurt the vine.

Mr. J. R. Gaston, of Normal, Ill., furnished the following history of the Snyder blackberry:

It was found growing wild on Henry Snyder's farm, near La Porte, Ind., in 1851. He planted it in his garden, where it has been growing and producing fine, lucious berries every year. About the year 1860 the La Porte Horticultural Society recommended it as the best berry known to them, and named it the Snyder. I have fruited it the last three years with perfect success. While the last winter, under the same conditions, the Kittatinny was killed to the ground, the Snyder produced a full crop; many of the terminal buds bloomed and produced fruit. We claim for it the following qualities: Great hardiness and productiveness, (has not winter-killed for twenty-two years,) fine flavor, and no hard, sour core, so common to other varieties; strong, upright canes, with short, stout laterals; ripening its terminal buds perfectly; sheds it leaves early and clean; the foliage is a dark, rich green; the canes have only half as many thorns as Kittatinny, and they are so nearly straight they do not hold the clothes of the pickers; the color of the berry is a glassy black, and when it is black it is ripe. In size it is about the same as Kittatinny, but is one-eighth shorter, and ripens one week earlier. The bloom is nearly all out at one time, consequently the harvest is short, the berries being picked in from fifteen to twenty days.

This report also contains the proceedings of the seventh annual meeting of the Northern Illinois Horticultural Society, held at Sterling, in January, 1874, and many essays and addresses on topics of interest to the farmers and the fruit-growers of the West, but the limited space allowed to these reviews forbids further quotations.

IOWA.

The annual report of the Iowa State Agricultural Society for the year 1872 fills a well-printed volume of 500 pages and upward. It contains the proceedings of the September meeting at Cedar Rapids, and the meeting of the society at Des Moines, January, 1873; detailed reports of the treasurer and secretary, showing financial operations for the year; reports of awarding committees of the nineteenth State fair; abstracts of reports of county and district agricultural societies; essays on various subjects; reports of discussions, and statistics of lines of railroads doing business in Iowa, showing principal commodities carried East and West, &c.

In his introductory report the secretary gives a detailed statement of the condition and yield of the principal crops of the State. The average yield of corn varies in different localities, from 25 to 75 bushels per acre. Many fields produce as high as 105 bushels per acre. Twenty-six counties are estimated as averaging from 25 to 40 bushels per acre; thirty-two counties between 40 and 50 bushels, and twenty-four counties between 55 and 65 bushels per acre. The general average of eighty-two counties is over 50 bushels per acre. In 1871 the corn area of the State was estimated at 2,500,000 acres, and the total crop, with an average of 40 bushels per acre, at 100,000,000 bushels. In the year 1872 only ten counties report any decrease of area, loss from late spring rains, grub-worms, or other causes, and these were limited in extent, while the majority of the newer counties report the average largely increased. Basing his statement on the ratio of increase as established by the four preceding years, the secretary estimates the number of acres devoted to this crop in the year 1872 at 2,633,891, which, at an average of 55 bushels per acre, produced the enormous amount of 144,864,005 bushels of corn. The supply was greatly in excess of the demand, and the consequence was that corn and pork were lower than for several

years past. Large quantities of the former were consumed for fuel, which, at from 15 to 18 cents per bushel, was found to be cheaper than wood. Thirty-three bushels make one ton of corn, which, at 17 cents per bushel, would be worth $5.61 per ton. For heating purposes one ton of corn is reckoned as equal to one cord of hard-wood at $8.50 per cord, a difference of almost one-fourth in favor of the former.

An unusually large surface of new ground was sown to wheat. In some of the southern counties the area was slightly decreased from apprehensions of an incursion of chinch-bugs. The crop was harvested and secured in good condition. In Shelby County a farmer raised on 81 acres 1,900 bushels, and sold it for an amount sufficient to pay for an entire quarter-section of land. Six counties report an average of 25 bushels to the acre; fourteen counties an average of 20 to 22; eleven an average of 18; twenty-one an average of 15 to 17; ten an average of 16; nine an average of 12; nine an average of 10; and two an average of 8, or a general average of over 15 bushels per acre. Taking into account the increased production or average in the eighty counties reporting, and the unprecedented area of new lands converted into wheat-fields in the northwestern counties, the secretary thinks the product for 1872 may safely be said to exceed 40,000,000 bushels.

Increased attention is being paid by the farmers of this State to the improvement of cattle. All the counties, with only three exceptions, report the importation of choice breeds; and a general awakening to the importance of securing better breeds both for beef and the production of milk seems to prevail. Short-horns, Devons, Jerseys, and Ayrshires have been largely introduced, and are giving great satisfaction. An increased attention to the rearing of sheep is also reported in eighteen counties; thirty-eight indicate less attention, decrease, or total abandonment of the interest; thirty-one show importations of Cotswold, Leicester, or Southdowns, and in many localities the indications are that sheep will become one of the recognized branches of farming in Iowa. The State has eighty-five woolen-mills, with a capacity of 196 sets of cards. The number of sheep returned in 1872 was 521,826, valued at $1,565,478. The entire wool-clip for this year was estimated at 1,500,000 pounds.

The secretary speaks at considerable length of the depredations of insects and other vermin. In June, reports from Johnson County stated that myriads of army-worms (*Leucania unipuncta*) were sweeping the meadows clear of every spear of grass; at night they would gather in piles of millions, perhaps for warmth, and during the day would spread themselves forth and make clean work. In Louisa, Van Buren, Wapello, Jefferson, Muscatine, Jasper, Washington, Iowa, Adams, &c., many timothy-meadows were destroyed, and left as if scorched by fire. In Cedar Township, Muscatine County, "hundreds of acres of grass were literally eaten up." The chinch-bug did much damage to wheat in Johnson, Van Buren, Wapello, Muscatine, Lee, Adams, Washington, Warren, Marshall, Appanoose, Decatur, &c. In Lee County the Hessian fly did some damage to the wheat-crop. Immense damage was done to growing vegetation in various sections of the State by the grub-worm. Marion and Lucas Counties suffered severe losses to valuable grapevines from a dark-brown beetle, three-eighths of an inch long, probably the *Bostricus bicaudatus*. It bores into the vines mostly at the joints, and devours the pith and some of the wood. Many large and valuable vines were destroyed. In June the apple, cherry, and plum trees in the vicinity of Keokuk were greatly damaged by an insect resembling in shape and size the potato-bug. It is of a dark-gray color, and was

found on the limbs of the trees. They girdle the large limbs, cut off the young shoots, and spoil the shape of a tree in about one day.

Stock suffered considerably from various diseases. The epidemic among horses prevailed in rather a mild form, and while but few fatal cases are reported none seem to have escaped the contagion. Near Moulton, Appanoose County, over one hundred head of cattle died from a disease supposed to be Texas fever, communicated through droves of cattle brought from the Southwest, and fed in that neighborhood. The mortality among swine was unusually great. In every part of the State and at all seasons hogs died in defiance of what seemed judicious care, and in conditions of no care at all. Losses of one hundred or more by a single individual, or in a circumscribed neighborhood, were frequently reported.

The nineteenth annual fair of the society was held at Cedar Rapids, commencing on the 9th and ending on the 13th day of September. It was largely attended by the people of the State, and in every respect more successful than any which had preceded it. The receipts from all sources were $18,691. Fifty per cent. of this amount was paid in premiums. In his opening address before the fair, President John Scott gives the following account of the introduction of blooded cattle into the State by Mr. Oliver Mills:

Fifteen years ago he (Mr. Mills) settled in Cass County, Iowa, then but sparsely populated, and with large quantites of very superior grazing-lands, open as public commons, with the intention of feeding cattle. He expected to purchase a large proportion of his stock from the people of that section, and his first act was to distribute twelve valuable thoroughbred short-horn bulls among these people free of cost. Mark the result: from this single act of one man with foresight and liberalty the whole Nishnabotany can boast of the finest grade of cattle in Iowa to-day, and have received for years an addition to their revenues scarcely to be estimated.

Let me give an example in illustration. In April last Mr. Mills sold six high-grade steers of his own breeding. One of these, only thirteen months old, weighed 1,275 pounds, and brought him $80. Five others, two years old, averaged 1,550 pounds, and sold for $97 each. A lot of three-year old steers, sold about the same time, weighed 2,050 pounds each, and brought $123 per head. But perhaps the best illustration is found in the experience of Mr. Mills' son, who bought a bunch of yearlings in September—half-bloods—costing only some $16 each, and weighing on the 10th of June following an average of 1,350 pounds, and selling for $68.50 per head.

While a few men were doing business in this way, what was the course of the average Iowa farmer? Your neighbors and mine were selling two-year old steers, full-fed, the common stock of this country, at less than $47 per head, making a difference to them and the country of more than $50 per head in favor of blood alone. Now multiply this by the number of cattle marketed annually by our farmers, and we have the astonishing result of two hundred times $50, equal to $10,000,000 per annum, which depends upon the conduct of our Iowa farmers, and which are gained by their wisdom or lost by their folly in one branch of industry alone.

In an address delivered before the January meeting of the directors of the society, held at Des Moines, President Scott urges the development of the resources of the State by the encouragement of immigration and the building up of home manufactories. He says:

The great need of Iowa at present is a development of her resources, and an increase of population and wealth consequent thereon, to be mainly brought about by encouraging manufactures here, thus bringing the consumer and the producer side by side, and solving forever this vexed question of transportation of bulky products of little value. What are the facts? We export hides and import leather, pay freights both ways. While flax is a cheap and abundant product, we pay for its cultivation at a distance, burn the corn that would feed the manufacturer, and import our linseed-oil. We export rags, waste other valuable material, burn straw, and import large quantities of paper. We export wool and import its products, burn corn, and pay freights both ways. We export cattle and hogs in large quantities, and import lard-oil, candles, glue, soaps, hair, dried beef, cured hams, cured meats, paying freight both ways. With samples of sirup and sugar here before us that are grown from our soil and manufactured at a profit, we exhaust our soils to raise wheat, give one bushel for marketing another, and buy the Cuban article, supporting the luxury of the ship owner, the palace

of the importer, the railway king, the army of middle-men, great and small, while our lands that we know will produce sorghum and imphee, and that we believe will raise the best article of sugar-beet, is annually sold for unpaid taxes. We buy lime, cement, stucco, land-plaster, fire-clay, fire-brick, tile, and all kinds of pottery and earthenware, with millions of dollars' worth of raw material under our feet. With all our milk-product we do not make the cheese we eat, and for lack of proper manipulations much of the so-called butter we ship rates in market as an axle grease of poor quality. We import starch at heavy expense, use corn for fuel, and leave potatoes to rot in the ground. We expend annually hundreds of thousands of dollars for canned fruits, vegetables, and pickles, burning our corn to cook that canned at Elgin, Benton Harbor, and Yarmouth. We buy our cooperage, sash, doors, blinds, tubs, pails, baskets, and above all our agricultural implements, at enormous cost, pay the pettifoggers for foreclosing mortgages to pay our indebtedness on all of them, and then utter pitiful wails about hard times.

The panacea for all these ills is to be found in tanneries, oil-mills, paper-mills, woolen-mills, meat-packing and curing houses, glue-factories, cheese-factories, butter-factories, candle-factories, sugar-factories, lime-kilns, plaster-mills, potteries, manufactories of canned goods, pickles, wooden-wares, cooperage, and the multitude of agricultural implements. We want all these that we may get the articles we consume at less cost, that their producers may consume our surplus food at better prices to us and less cost to them than it must bear to others like them, who use it at a distance.

Mr. Phineas Caldwell contributes a valuable paper on the subject of sorghum and its production in Iowa. He gives the total area devoted to the cultivation of this crop in 1871 at 40,000 acres. This he values at $68.13 per acre, giving a total of $2,725,200 for the entire crop. Mr. William Smay, of Story County, seems to be the only person in the State who has succeeded in making sugar from this cane. He has made large quantities the past three or four years. Mr. Caldwell has used two barrels manufactured by him and speaks very highly of it. It does not color tea or coffee in the least. The molasses is made in a pan so arranged that all the scum can be removed. Sometimes the molasses granulates in a few days; again, it may require from one to six months. He regards the Otaheitan as the only variety that will certainly make sugar. The yield is from six to nine pounds of sugar per gallon of sirup. The following is given as a fair average of the cost of cultivating this crop: Plowing and harrowing one acre, $2.50; planting and hoeing, $4; stripping, cutting, and hauling, $6; rent of land, $4; cost of manufacture, $22.50; total, $39.

Placing the sirup at the low estimate of 50 cents per gallon, and the yield at 100 gallons per acre, which is regarded as a very moderate estimate, it leaves a profit of $11 per acre. Mr. Smay reports a clear profit of $82.50 on sirup from two and one-half acres, and adds: "I expect to do better than this. I will make from five to seven pounds of sugar to the gallon, and have more than enough sirup left to pay for separating it."

Mr. E. W. Skinner, of Sioux City, gives the following directions for planting and cultivating Chinese sugar-cane, and the manufacture of sirup therefrom:

Plant early, that the seed may fall in moist earth; avoid weedy land; plant as soon after plowing as may be, so that the cane will have equal chance with the weeds. Sorghum requires more nearly the treatment of the grasses in planting than cereals. It should be planted before corn, and covered light. It will stand more frost and freezing than corn, and if cut down by an early frost it will start again if the roots are not injured, though it is best to nip off the frosted leaves by hand. Seed should never be planted without first being tested by sprouting. Cultivation should be commenced as soon as the plants are well out of the ground, and must be thorough while the plants are small. Late cultivation must be avoided. Harvesting varies with seasons and varieties; the best sirup is made from cane not fully ripened. As soon as matured, cut, pile, and cover with leaves; never allow it to stand after maturity in connection with the roots. The best time to work is when the cane is ripe, but with proper piling and covering it may be kept for weeks without spoiling. Early frosted cane should be worked at once. The great impediment to success is the want of good seed. To get the best, seed should be procured from every field of ripened cane that

yields 200 gallons of sirup per acre. They may be kept good and fresh for three or four years, and when a good yielding field is found a supply should be gathered and carefully saved for the future.

In working, the first thing to be done is to select good and efficient machinery, and to have it well arranged. The first cost of good apparatus is greater than that of a poor article, but the difference is soon made up by the increased profit of working it. The arch and chimney to the evaporator should be so constructed as to insure a good draught. When the juice is placed in the evaporator, it should at once be brought to a brisk boiling; if boiled slowly, the gumming matters will not be separated, but more thoroughly incorporated. The scum should all be saved carefully. The first that rises, the green scum, should be placed by itself and fed to the stock. The lighter scum, or that which rises toward the back end of the pan, should be put into a barrel and when cool skimmed again, and then put into the evaporator and reboiled, with a small addition of juice. From the washings and skimmings of this scum an abundant supply of vinegar may be made. The evaporator should always be covered, for if left exposed to the sweep of cold currents of air, it will greatly retard the evaporation.

Salt is the best and most convenient purifier. It acts the same as blood in coagulating impurities; it also corrects the acid taste. Usually one teacupful to a barrel of juice, mixed before it is put into the evaporator; in clear, good juice, one-half that quantity. For sour juice, saleratus is preferable to lime, as it does not color the sirup. The exact quantity to be used can only be determined by the use of litmus-paper; ordinarily a teaspoonful in a barrel of juice is sufficient. Good, sweet cane, worked at the proper time, will not require any saleratus, but any juice will be improved by the use of salt. Fuel is a most important item, and hay may be used with the very best results; it makes a strong blaze, does not require any more attending than wood, and to my mind solves the problem of reducing sorghum on the prairies.

The following results of experiments with crops in Scott County were communicated by Mr. John Long:

EARLY CRIMEAN WHEAT—*Twelve acres.*—The ground was in corn last year. In spring, as soon as the ground was in good order, we cut the stubble, plowed six inches deep, harrowed twice before sowing, twice after, sowed with drill on 10th of April, two bushels per acre, and rolled it; cut with the Marsh harvester. Yield, 25 bushels per acre. Total yield, 300 bushels.

BARLEY—*Sixteen acres.*—The ground prepared same as for wheat. Sowed on 10th day of April, with drill, two bushels per acre; cut with McCormick reaper. The crop was so heavy that it lodged badly. Owing to heavy rains the grain was discolored. Yield, 39⅜ bushels per acre. Total yield, 630 bushels.

SWEDISH OATS—*Twelve acres.*—Ground prepared same as for wheat. Sowed on the 22d day of April, with drill, two bushels per acre. Yield 50 bushels per acre.

POTATOES—*Six acres.*—The ground was in corn last year. We cut the stalks, raked and burned them; plowed eight inches deep on the 26th of April, harrowed twice, marked three feet each way. Potatoes cut to one eye in a set; planted three sets in a hill; covered with a hoe; harrowed twice just as they were coming through the ground; cultivated five times; dug with a fork. Yield, 241 bushels per acre.

CORN—*Forty-six acres.*—Stubble-ground; hauled twelve loads of manure to the acre; plowed half in the fall and half in the spring, nine inches deep. Fall plowing, cultivated once; harrowed twice. Spring plowing, harrowed twice. Marked three feet and ten inches each way; planted four grains to the hill; planted from the 5th to the 20th of May; harrowed once just as it was coming through the ground; cultivated three times with double cultivator. Yield, 75 bushels per acre. Total yield 3,450 bushels.

KANSAS.

The transactions of the Kansas State Board of Agriculture for the year 1872 contains the special report of Mr. Alfred Gray, the secretary; the proceedings of the board embracing a report of the annual exhibition held at Topeka in September of this year; reports of district and county organizations, with a synopsis of awards, and a general review of the condition and progress of these societies; prize essays and practical papers, embracing a vast amount of useful information on subjects relating to agriculture and the mechanic arts; a paper explanatory of the Department of Science, a society which has been made a co-ordinate branch of the State Board of Agriculture; an interesting paper on the subject of the State Agricultural College; several illustrated articles from the pen of Professor Riley on the science of entomology, &c. To

this is appended the transactions of the State Horticultural Society, embracing interesting discussions and some very able papers on the subject of fruit-growing in Kansas. The whole is embraced in a well-printed volume of 638 pages.

In his special or preliminary report the secretary states that during the past year there has been an increasing interest in and demand for information concerning agriculture, horticulture, stock-raising, manufactures, &c., by those who are seeking, as well as those who have already found, homes in the West. He thinks that well-prepared and carefully digested tables, showing the actual progress and development of the State, so that comparative statements with the progress of other years and other States could be made, would prove of incalculable value in inducing immigration. Speaking of the importance of a thorough knowledge of the principles which underlie all successful agriculture, he says:

There is no proposition more self-evident to the careful observer than that individual and national prosperity depends upon the productive qualities of the soil. Where the soil is rich and the fertility is maintained through a series of years, an accumulation of wealth is the result, which in part is observable in improved school-houses and churches, comfortable and attractive homes, and the varied luxuries and enjoyments attending prosperity. Where the soil is poor, or the fertility is not maintained, a corresponding decline and want of thrift is noticeable. All the surrounding and dependent industries are quickened or deadened by the degree of prosperity attending the former, or, more truly speaking, by the elements of fertility maintained in the soil. The gradual decline of fertility may not be observable until too late to apply the proper remedies. The incalculable value, therefore, of the statistics gathered from year to year to enable the farmer, the political economist, and the statesman to comprehend at one glance the true condition of things needed, can readily be seen. If soil will produce less per acre of any given crop, or of the principal crops, in 1872 than ten years ago, it is important to individuals and the State to know it in order to apply the proper remedies.

An important convention of the farmers of Kansas was held at Topeka on the 26th and 27th of April, 1873, the proceedings of which appear in the present volume of the transactions of the board. The meeting was called for the purpose of devising means looking to a reduction of transportation rates, and for the better protection of the farmer in the disposition of his products. Mr. Bronson, of Douglas County, in explaining the objects of the meeting, called attention to the fact that the farmer is actually giving one-half of his products to an inconsiderable number of men for handling the other half. As a result of this, colossal fortunes have been amassed, and enormous monopolies have grown up out of the wealth that should have been retained by the farmers. Under the present system, out of all they produce there is left them barely sufficient to recuperate the physical exhaustion incurred in producing it.

Governor Robinson thought that the only remedy farmers could hope for was by well-considered organization. The old question of demand and supply was obsolete; none of the great interests were ruled by it. It is now combination which determines the price at which iron and other commodities are sold from New York to San Francisco. All classes, whether they be mechanics, engineers, shoemakers, or bootblacks, combine and fix the price of their different products or labor. We have parallel lines of railroad, but they combine and do not compete. If the farmers were to combine and hold their hands, the people would perish. There was but one course for the farmer to pursue, and he would not give one fig for anything they would accomplish unless they did it. He advocated county and State organizations, auxiliary to a national one, and all should be in correspondence with headquarters. The national directory should set the price for farm-products in our cities, after all the necessary statistics have been furnished by the subordinate

organizations. The State organizations should, within their limits, gather statistics and fix prices, and county societies should do the same. The farmer would then handle the same weapons and be on the same footing with dealers in iron, wool and cotton.

Several gentlemen followed Governor Robinson in brief addresses, indorsing the plan set forth by him. The following resolutions were finally adopted as the sense of the convention:

1. That organization is the great want of the producing classes at the present time, and we recommend every farmer in the State to become a member of some farmer's club, grange of the Patrons of Husbandry, or other local organization.

2. That the taxes assessed upon the people, both by national, State, and local governments, are opressive and unjust, and vast sums of money are collected far beyond the needs of an economical administration of government.

3. That we respectfully request our Senators and members of Congress to vote for and secure an amendment to the tariff laws of the United States, so that salt and lumber shall be placed on the free list, and that there shall be made a material reduction on the duty on iron, and that such articles as do not pay the cost of collection be also placed on the free list.

4. That we earnestly request the legislature of our State, at its next session, to enact a law regulating freights and fares on our railroads upon a basis of justice, and that we further request our members of Congress to urge the favorable action of that body, where the full power exists beyond all doubt, to the same end, and, if need be, to construct national highways at the expense of the Government.

5. That the act passed by the legislature, exempting bonds, notes, mortgages, and judgments from taxation is unjust, oppressive, and a palpable violation of the State constitution, and we call upon all assessors and the county boards to see that said securities are taxed at their fair value.

6. That giving banks a monopoly of the nation's currency, thereby compelling the people to pay them such interest therefor as they may choose to impose, seven-tenths of which interest we believe is collected from the farmers, is but little less than legalized robbery of the agricultural classes.

At the January meeting of the board, Dr. John A. Warder, of Ohio, briefly addressed those present on the subject of forest-tree culture. He said:

The planting of forests is a momentous question, and no one doubts it, whether planted for the wants of life, for shelter, or for a continuous supply of water. One-fifth of every farm might be devoted to trees; there are trees for all kinds of lands, and there was good authority for saying that one-fifth so planted, the remaining portion would produce more than the whole. The climate of Illinois is less windy to-day than forty years ago; this can only be attributed to the growth of trees, to fencing and to other obstructions. General lines and groves of trees modify the climate; break up the soil and you have a moister atmosphere, and the coming in of long grasses to the displacement of a shorter growth are sure indications of improvement in conditions of moisture. Dead-furrows that run off water and make bad washings should be avoided. Plant timber, and plenty of it, to counteract the aridness of pastures. Such is the destruction of timber going on everywhere that the present supply would end in twenty-five years. The forests of New York and Maine attest its truth. The timber-trees of Maine are nearly exhausted, and twenty years more will accomplish it in Michigan. The railroads of Kansas have consumed nearly every stick of timber on their lines. Plant trees for profit; it can be shown that tree-planting is profitable as a crop. The timber of our domain is scant, and only sufficient for the immediate localities. There are fifty thousand miles of railway now in the United States, and it goes on increasing, every mile of which consumes 2,700 cross-ties, made of young trees, two to three to the tree; 15,000 acres of land must be stripped every eight years for ties, not to mention bridges and fencing for tracks. An immense amount of wood is required for locomotives, and it takes from 90,000 to 100,000 acres to feed the engines a year. It took 20,000 walnut-trees to furnish a European factory, which were to be used in making gun-stocks for rifles to be sent back to this country.

Mr. J. A. Beal contributes a paper on the subject of raising, feeding' and managing horses. The writer devotes the largest portion of his essay to the treatment of brood-mares during the period they are carrying their foal, and to the care and proper management of colts. His experience has taught him that the dam should not be worked while suckling her colt, but if it should be found necessary to use her, great

care should be taken that she is not overworked. Good pasture for her is almost indispensable to the growth of the colt; a little grain, regularly given, is also necessary. Colts should not be weaned too soon; if they can run with the mother six or eight months, so much the better. The mother's milk furnishes the best nourishment for it until the stomach is fully prepared by age for stronger and coarser food. Much is lost in the form and growth of colts by suffering them to fall off in flesh at weaning; they should be kept steadily growing, especially for the first two years, as they scarcely ever recover from a stunt suffered during this period. An open field to run in during the day-time, warm and comfortable quarters at night, and plenty of hay and grain to feed upon while confined, will be amply repaid in the growth and spirit of the animal. The colt should be handled from the beginning; let it be made perfectly familiar with every use to which it will be put when it comes into common service; use it to the halter; take up its feet; put bits in its mouth; treat it kindly and familiarly, and there will be no necessity for resorting to the barbarous practice of breaking your colt with the gad and lash. Grass, either green or cured, is the natural feed of horses, and should be abundantly supplied. No farmer should deprive his animals of pasture at night during the grass season. They will do better turned out into a good pasture after the day's work is over than if continually kept in the stable when not in use.

The following extracts are taken from an article contributed by Mr. F. D. Coburn, on the subject of raising, feeding, and the management of hogs:

It is claimed by many interested in the English breeds of hogs, such as Berkshire and Essex, that our American hogs, such as Poland-China and Chester-white, are "made-up" breeds, (what breed is anything else?) and have not been bred distinct for a sufficient length of time to make them reliable in producing offspring similar to the parents. But it is well known that the best families of those have been bred and crossed together for from twenty-five to forty years, and with an animal as prolific and impressible as the hog this is sufficient time to make them sure enough for all practical purposes. From experience and observation I am satisfied that the best strains of these American hogs will reproduce equally as true as any imported stock, though there are thousands of grade hogs palmed off upon persons unacquainted with the points of full bloods, and of course such stock, as breeders, cause disappointment and loss as well as prejudice against the breed. To breed hogs successfully it is of the utmost importance to make a judicious selection of a boar. He should be of pure blood, as perfect as possible in all the points which constitute the good qualities of his race; the offspring of parents uniformly healthy and of unexceptionable points. He should be fine boned and more compact than the sows to which it is designed to breed him. From birth he should have a liberal allowance of good food, and always be kept in a thrifty condition. It is not, as a rule, desirable to allow a boar to run at large, but he should be kept in a comfortable and reasonably roomy pen, where he will not come in contact with or worry other hogs. When ten months old he will be fit for moderate service, and if a good selection has been made and properly treated he should be a square-built, compact pig, of 250 pounds weight, in working order. But one sow should be turned with him at once, and never more than two in any one day. If the boar and sow are together thirty minutes there will be as many pigs as if together a week, and the boar is saved much useless exertion. Should the sow fail to get with pig the first time, she will come round again in about three weeks. With such a boar as the one described it is not at all necessary to have thoroughbred sows in order to raise hogs of a high order as pork-makers. Grade (say half-blooded) sows of the Chester or Poland-China breed that are large, lenghty, and good feeders will be found unsurpassed for producing good farm-hogs, and especially hogs to follow cattle that are being fed grain. Sows should take the boar when not younger than eight or nine months, and, as a rule, from the 1st to the 20th of December is the best time. She will go from fifteen to sixteen weeks and three days—old sows go longer—before farrowing, and during this period she should be in comfortable quarters, with nutritious food in variety, and allowed plenty of room for exercise.

The writer then gives directions for the care and management of the sow after pigging. She should be confined to a pen, free from molesta-

tion by other hogs, and the pen should be so arranged as to prevent the overlaying of the pigs. As she is now expected to furnish an almost unlimited supply of milk, she should be furnished with an abundance of food similar to that given a cow from which a like result is expected Nothing will be found better for this purpose than wheat-bran which has been thoroughly wet with boiling water and allowed to stand from twelve to twenty-four hours. No sow, however large the quantity of feed, can furnish milk enough for a strong litter of pigs four or five weeks old, and without a supply of rich food for them, aside from that furnished by the mother, they cannot thrive. At two weeks old they should have a shallow trough with some milk in it, where they can go and eat at will. At six weeks old the boars should be castrated and the sows spayed, and in a fortnight they will be well and of the right age to wean. Pigs cared for as directed will receive no check in their growth by being weaned, if still supplied with nourishing food and comfortable quarters. Growing hogs should have room for exercise; they will do better with the range of a field or pasture than if kept continually confined in the dust and mud of a pen. When ready to fatten they should be confined in dry, comfortable quarters, with plenty of room, and an abundance of fresh air and pure water.

Mr. F. E. Miller, superintendent of the Kansas Agricultural College farm, contributes a very valuable paper, giving the results of his experiments with manures. The following facts illustrate the great value of green stable manure as a productive agent:

One-half of field No. 7 of the Kansas State Agricultural College farm is a badly washed hill-side, washed to the underlying red and yellow clay. The other half of the field is second bottom; the soil a deep alluvium, rich and black. A sharper contrast in one field could hardly be imagined. This contrast furnished an opportunity for testing the relative merits of manure, an opportunity that was gladly improved. Early in May the clay hill-side was dressed with green stable-manure, at about the rate of thirty tons per acre, which was immediately plowed under to the depth of five or six inches, the nature of the soil not permitting a deeper furrow. Even at this shallow depth the soil rolled up after the plow in hard, sticky masses, upon which harrow and roller had but little effect. Many who saw the field at this time expressed the opinion that the hill-side would not produce even corn "nubbins." After plowing, the clay hill-side was top-dressed with a compost of rotted manure, ashes, and old mortar, at the rate of fifteen two-horse loads per acre, after which the whole surface was repeatedly harrowed and rolled. As soon as this was finished the whole field, the lower half having been plowed to the depth of eight inches and thoroughly harrowed in the mean time, was marked off and planted with corn, the Milton or Mammoth Dent.

No manure was used upon the lower half of the field. Both parts were cultivated alike. The land was new, this being the second crop from the sod. The crop was harvested the last of November, and returned 45 bushels per acre from the lower land and 65 bushels per acre from the manured clay hill-side, an advance of 45 per centum in favor of the washed hill-side, and attributable alone to the effect of the manure. In the earlier part of the season this field was frequently trespassed upon by cattle, and probably one-third of the crop was thus destroyed. As the two parts of the field suffered alike, the result *pro rata* is the same, and we have in contrast the poorest and best of our Kansas soils. The poorer, treated with manure at a cost of $11 per acre, exceeding by 45 per centum the yield of the better soil without manure. It would be difficult to more strongly illustrate the effect of home-made fertilizers upon Kansas clays.

The contrast in this single instance, however, may be too well defined for general application. Fields Nos. 5 and 6 of the College farm present no such contrast, being identical in soil and situation, the division being entirely arbitrary, and only indicated by a narrow drive. These two fields are a fair representation of prairie loam, conforming essentially to the soil of the second bottom of field No. 7. Field No. 5 received an application of green stable-manure, at the rate of 40 tons per acre. No. 6 received no manure. Cultivation essentially the same. Result: the yield of sound corn upon field No. 5 was 100.1 bushels per acre, as ascertained by actual measurement by a committee of disinterested persons. The return from No. 6 was between 60 and 65 bushels per acre, or an increase of 58⅓ to 66⅔ per centum per acre, due solely to the use of manure.

In the course of an essay on the subject of the grains of Kansas, Mr. J. K. Hudson gives some facts relative to the productiveness of the soils of that State. It appears that in 1870, with a population of 206,000, Kansas produced 2,000,000 bushels of corn, exceeding all other States in average yield per acre. Corn being the great staple of the western States, the writer gives the following directions for the selection of seed:

The selection of seed is deemed of more than ordinary importance. The mixed condition of our corn crops detracts from their market value, and it is believed that the promiscuous mixing up of varieties causes degeneration. Pure white or yellow corn, which will not breed back upon other varieties, is not common. In the preparation of seed little care seems to be exercised in selecting for a field seed of a particular shape and shade of color. In this way the different types of white corn have become very much mixed, and the same of yellow varieties. In preparing seed we select the cob-corn having a medium-sized cob, bearing from sixteen to thirty-two rows, smooth, compact, heavy, and well developed at both ends. The corn giving these characteristics is a cross between the gourd-seed variety and the common, smooth, flat Dent corn. The Dent variety has not the depth of grain to secure weight, and the gourd-seed has neither compactness nor solidity; besides, it has a hard, sharp husk in the grain. In yellow corn nothing is better than the above crop. For early feeding in the year of scarcity the shoe-peg variety will be found valuable, as it yields well and matures in midsummer. The red or flesh-colored field-corn matures somewhat earlier than the ordinary white or yellow corn. It is prolific, but nearly always breeds back more or less upon the yellow.

On the subject of wheat culture, the writer says that the cost of a crop varies with locality, price of labor, and interest on land. With the present cost of labor, interest, &c., wheat yielding 20 bushels per acre costs $17. At $1 per bushel, to make the growing of this crop a profitable business, the average yield must be raised, and farm labor be had in proportion to prices of farm produce.

Mr. R. S. Elliott contributes an article on the subject of forest-tree culture in Kansas. Out of 52,000,000 acres of land, the aggregate timbered surface of the State, mainly in the eastern portion, is estimated at 2,560,000 acres. The western three-fourths of the State, except fringes and groves along the water-courses, are treeless plains. Thus, without shelter of mountain or forest, north, south, or west, Kansas must have the winds sweeping over her plains with less than 5 per cent. of her surface in timber. But the writer thinks this need not be the case many years hence, as recent experiments have demonstrated that trees can be grown without irrigation to the western borders of the State. He says:

In the western belt, from Ellis to the Colorado line, we are in a region heretofore reputed worthless. It is the traditional "desert," but it is not, in fact, a desert. It is only an immense region of grass-covered plains, rising above the level of the sea from 2,000 feet at Ellis to about 3,500 feet at the west line of Kansas; a region of good soil, but with a climate less propitious than in the middle and eastern belts. Starting at the east line of the State, with a yearly rain-fall averaging 42 inches, there is a gradual diminution toward the west, until at the west line it is not more than half that measure; and with decreasing rain-fall we have increasing dryness of the air and more persistent winds. These conditions are unfavorable to forest growth; yet the trials made under order of the Kansas Pacific Railway have shown that several varieties of trees may be grown with a fair share of success, even to the remotest border. It would be idle to expect them, without irrigation, to exhibit the vigorous and luxuriant growth to which we are accustomed in the middle and eastern belts; but they do live and grow sufficiently to compensate for planting and care.

The fact that trees may be grown to the west line of the State without irrigation, where it has been supposed to be essential, is to have great significance in the future in aiding the progress of settlement. The increasing population of the United States indicates that the plains of Kansas will soon be needed in all their extent for productive uses. It will be a comparatively slow process to establish settlements, with comfortable homes, sheltered by forest and fruit trees, in all parts of that immense region called "the plains;" but as the years roll on even this will be accomplished. The sparse settlements already extended to Ellis will, in time, be continued westward to meet those coming eastward in Colorado.

Mr. E. Gale, in an article on forest-tree culture, says that the present and future interests and welfare of this country depend, to a large extent, on the immediate planting of extensive forests. He says that trees should be made to spring up everywhere; especially should this be the case on lands which cannot be easily tilled. There are millions of acres which should neither be tilled nor closely pastured. A flock of sheep would soon leave the kind of lands alluded to without grass or soil. Being too rough and steep for continued cultivation, they should be covered with forests. On almost every farm of any extent can be found these rough and unsightly spots—blemishes upon the beauty of the landscape, which, if planted to forests, would add greatly to the attraction of home and millions to the wealth of the land. He continues:

The great rapidity with which trees grow is a special encouragement in forest culture. Instead of waiting many years for any available results, as many very naturally suppose, very material advantages will accrue in four or five years at the longest. In that time, several of the more rapidly growing trees may be thinned out to advantage if they have been planted thickly. From a few acres of this closely-planted forest, the farmer may supply himself with wood, and also with much material which will be of great service to him about the farm. The impression obtains to a large degree that he who plants forests plants for his children. While this is literally true, it is also true that the planter may derive almost immediate advantage from his work, provided he enters upon it with a proper degree of intelligence and care. An investment in trees, judiciously planted, will add many times their cost to the salable value of any Kansas farm. Indeed it may well be questioned whether there is anywhere a more desirable and certain investment against the contingencies of the future than may be found in a judiciously laid-out and carefully-planted forest. It may be regarded as certain that land, which to-day is not worth more than $5 per acre, if wisely planted to forest will, fifteen years hence, realize the owner from $200 to $500 per acre. A gentleman, whose statement should be good authority upon a point like this, realized in the comparatively wooded State of Ohio, as the result of only fifteen years' growth, $800 per acre; and it is not at all improbable that as good results may be realized here, by such persons as may be shrewd enough to read the signs of the times. Every tree planted is so much money invested—sure to bring ample returns. And he who plants at all, will act wisely if, while planting for himself, he shall also plant for his more improvident neighbors. Thousands on thousands, who have homes in this State to-day, to say nothing of the thousands who are coming, will purchase their wood and timber fifteen years hence. Fence posts, railroad ties, vineyard stakes, by the million, and timber of every kind, will be always in demand.

From an article on the stones of Kansas, contributed by Mr. J. G. Haskell, the following facts relating to the geological formations of the State are given:

The limestones may be said to be the leading material in the State, and the blue, the gray, and the white are the leading divisions. The blue and gray are most general in their distribution, nearly all the common limestones found everywhere being related more or less nearly to these two classes. The white, as at present developed, extends over the greatest area, and is more nearly uniform in leading characteristics than any other material in the State.

This great belt of choice building material enters the State from Nebraska, through Marshall, Washington, and Nemaha Counties, and following Clay, Riley, Pottawatomie, Dickinson, Davis, Morris, Marion, Chase, the west part of Lyon, Butler, and Greenwood, disappears in the sand formations of the Arkansas slope. Detached quarries of the same general class are found in the counties adjoining those above named, but these embrace most of the field above referred to. An interesting and instructive paper could be written by a geologist touching the differences in color and minor characteristics of the quarries along this belt; for example, the stone along the eastern side of the belt at Waterville, and down the Blue River to Chase County, is of a grayish white color, and more or less porous. That down the Republican River, at Junction City and along the western side of the belt into Marion County, is of a light cream color, and porous. In Lyon and Morris counties it seems to attain its maximum hardness. In Chase County it reaches its greatest perfection, being quite white, and almost entirely free of the porous condition above referred to. In Butler and Greenwood it is not only hard, but contains more foreign substance than elsewhere. These ledges differ from those of the common material, inasmuch as they are more solid, less "seams" or "drys," and yet are broken enough to render the process of quarrying an easy one. The thickness of the ledges is from three to seven feet in layers or courses,

of from eight inches to five feet, furnishing material of all dimensions for any required use.

A portion of the stone within the range above referred to, resembles in texture the celebrated soft stones of Europe; can be sawed with a common wood-cutting instrument; can be planed to a surface with a common wood-working tool; and yet, properly handled, will carry its full load in the largest structures. The surfaces harden instead of wearing with exposure, so that, judging from the appearance in the quary, a sufficient length of time would render the exposed surfaces nearly as hard as glass. Frost seems to possess no power over any of the material in this belt. It is a well-known fact that nearly all hard limestones, in common with all other building stones, yield to the action of the frost when taken from the ground late in the fall or during winter. The experiment has been fully tried at various places in all parts of this immense field, and no appreciable difference is observed as to the season when the material should be taken from the ground.

Additional extracts are given from the report of Mr. Fred. E. Miller, superintendent of the college farm. The following extracts, detailing results of experiments with field No. 5 containing four and one-half acres, are deemed worthy of attention:

Bur-grass, cockle-bur, jimson, and smart-weed, were contending for the mastery in this field, when we first took hold of it in October, 1871, with the odds in favor of the bur-grass. A crop of millet and potatoes, after oats the season before, had just been taken off, and weeds were running riot in the stubble. After harrowing together and burning what we could, a twelve-inch plow, drawn by a powerful mule team and held by a skillful plowman, turned up to the light of day the soil to a depth of 14 inches, by the rule, and the field left as ridged by the plow to the action of frost through the winter. A heavy coating of green manure, forty tons per acre, was spread on the whole field, and a portion of it in the spring treated with lime at the rate of 15 bushels per acre. The land was again plowed in the spring as deep as a 14-inch plow, drawn by our heaviest team, could be induced to run. The surface was thoroughly pulverized with the smoothing harrow, and marked off one way in rows 3 feet 6 inches apart. April 25 the field was planted with yellow Dent corn, using the Vandiver planter, dropping in rows 3 feet 10 inches apart. The whole was then rolled, and five days later the smoothing harrow passed over both ways. The surface was white and glistening after the passage of the harrow, with sprouting weeds turned up to be killed by exposure to the sun. The after cultivation consisted in running single and double cultivators between the rows as often as the growth of weeds required, which was about twice each week for some six weeks. Being near the farm-house much of this extra work was done at odd moments, after finishing some larger field, &c., when half an hour or so was to spare before turning out at noon or at night. Nevertheless, although the time could not have been well put in elsewhere, at least always, yet the time and labor so devoted was as regularly charged up as in all other cases. The stock of weed-seeds seemed to be almost inexhaustible, but at last perseverance conquered before the corn got too high to work with horse power. A partial hoeing, as the corn was suckered, left the field, which had been among the foulest of the foul, among the cleanest of the clean. Owing to the thorough preparation of the seed-bed, the planter failed to cover scarcely a hill, and the stand was remarkably even and perfect. The few hills missing were filled in by transplanting on a couple of rainy days, when the plants were a few inches high. There was no replanting. The stand was thinned to two or three stalks to the hill. The corn on the plat dressed with lime preserved a deeper color during a short drought early in the season, and, it was thought, made a little the best growth. No part of the field, from beginning to end, showed signs of distress—not even a curl of the leaf in the hottest and dryest weather.

Three plats, each one rod square, cut and shocked September 7, and husked September 14, yielded respectively 53½, 51, and 45 pounds of corn in the ear, fit to crib, or to shell for grinding. The entire yield of the first plat was placed on exhibition at the State fair in Topeka. This is at the rate of 118 8.9, 113⅓, and 100 bushels shelled corn per acre, reckoning 72 pounds, in the ear, to the bushel. The second and third plats were taken as near each other as possible, and yet far enough apart to give correct results, care being taken to select plats as nearly equal in stand as possible, No. 2 being on the land dressed with lime, (as also No. 1,) the top-dressing of lime to the value of $3.75 per acre, giving an increase of 13⅓ bushels. This, at 25 cents per bushel, nearly returns the investment the first season.

September 26, one acre was measured from center to center of space between rows, by a committee of disinterested neighbors. The corn previously cut and shocked (on the acre only) was husked in their presence, and weighed and measured 88.7 bushels. In this connection it should in justice be stated that heaps of husked corn of a bushel or more were found on the ground (sprouted) in the interior of the field. How it came there is a mystery; but the fact that the field is adjacent to the highway, over which

emigrants and freighters were constantly passing, may afford a little light. Several bushels were selected from this field for exhibition at the fairs, district and State, and all prior to this trial-report of the committee.

The writer gives the cost of the crop at 19 cents and 9 mills per bushel. But, giving this year's crops due credit, charging only the portion of manure and labor absorbed by it, and debiting the land with the portion remaining to be carried forward to the charge of other crops to come, and the cost is reduced to about 14 cents and 4 mills per bushel.

MAINE.

The annual report of the Maine State Board of Agriculture for the year 1872 is one of unusual interest. The volume, well printed and bound, contains over 500 pages of matter relating to the progress of agriculture and subjects of kindred interest in that State.

The winter session of the board was held in Paris, commencing on January 23, and continuing three days. The attendance of farmers and others interested in the progress of agriculture and the development of the material resources of the State, was unusually large, and the interest taken in the addresses and discussions was of a most gratifying character. Among the more important articles and lectures at the fall and winter sessions, may be mentioned the opening address of Governor Perham; "The aims and methods of the Maine College of Agriculture and the Mechanic Arts," by President Allen; "Lightning and the means of averting its destructive effects," from the pen of Professor Fernald; and "The production of milk," "Orchards and fruit culture," a valuable essay, by Mr. T. S. Gold, of Connecticut; "The management of meadows and pastures," an equally valuable paper contributed by Mr. John Stanton Gould, of New York; "Common errors in rearing and feeding farm stock," by Mr. L. L. Lucas; "Value of the sugar-beet for stock feeding," by Mr. Henry Lane, of Vermont; "On the changes which have been, and which should yet be, made in farming," by Secretary Goodale. In addition to these papers, which are all valuable acquisitions to the agricultural literature of the year, the report contains discussions on various subjects of great interest to the farming community.

Governor Perham, in his opening address, alludes to the great importance of the grass-crop to the people of that State, and the consequent disastrous effects of its partial failure for the two preceding years. The crop was reduced from about 1,000,000 tons to 700,000 tons in 1870, and it fell below 500,000 tons in 1871. This compelled the disposing of a large amount of stock, and the extensive purchase of corn raised in other States for the purpose of maintaining that carried through the severe winters which followed. But the result was even worse than this, in that two years of extreme drought have undoubtedly injured the grass crop for some time to come. They have not only greatly reduced the crop on old grass-fields, but the growth of new grass has been prevented. Many fields which were laid down and expected to produce a new crop of grass, will have to be plowed and cultivated again before it will be possible to get it. When it is remembered that grass is the most important crop of Maine, it will readily be seen how even its partial failure for one season will seriously affect all the other interests of the State.

As an offset to the argument used by many, that the State, lying away off to the northeast of the country, is a frozen region where not much can be raised, Governor Perham makes the following statement in proof of the wonderful agricultural capabilities of its northern section:

In Aroostook County, a county that has not been very much developed, and of which we know comparatively little, we have a large amount of land still unculti-

vated, still untouched by the ax, that is equal to any that can be found in this part of the country, producing crops in many instances almost marvelous. I noticed just now a bunch of clover that was sent all the way from Aroostook County down here, showing what can be raised on that land. (The clover referred to was a bunch consisting of 80 stalks, apparently grown from one seed, about four feet in length, and weighing three pounds and six ounces. A single stalk had twenty heads; one taken at random counted out forty seeds.) I am informed by persons who have been farming there for some time, and who have been engaged in clearing the land, that the better way, after the land is cleared, is to raise three crops of wheat in succession before seeding down. You cannot do that in other portions of the State. They say they get good crops of wheat for three years, and better grass if laid down the third year than if laid down after raising only one crop. You can see from this that the land is very rich. In a little colony which has been established there, called New Sweden, where some foreigners have collected together, crops were raised last year which to me were really marvelous. They went in there only a year ago last autumn, and began to fell their first trees, and the latter part of last September, or 1st of October, when I first visited them, I found they had raised crops of wheat that perfectly astonished me. The snow lay on the ground very late last spring, and some of you may recollect that a freeze came on very early in the fall. You are aware that in small openings, such as those men made there, of 10 to 15 acres in a place, it takes longer for crops to mature than in larger fields. The freeze came upon that wheat before it was fully grained, but the kernels were sufficiently formed for a yield of at least 30 bushels to the acre, and that is double the average crop of the wheat lands of the West. The other crops grown were in proportion to this, showing that the soil is very rich.

In the course of a lecture on the aims and methods of the Agricultural College, President Allen says that it is not a professional school to prepare the students exclusively for any trade or occupation in life, nor is it designed alone for those who are to be farmers and mechanics. It does not teach fully the art of farming, or any of the useful arts. A full knowledge of any art, and skill and proficiency in its use, can only be attained by one who gives his exclusive attention to such an avocation, as the business of life. Its design is to lay the broad, deep foundations of a liberal education which is best adapted to industrial pursuits; so that in whatever department of industry its graduates may enter, they will be successful business men, farmers, or mechanics, and also intelligent, educated men, prepared to guide the thought and intelligence of the whole community where they dwell. It is not a high school nor an academy; for its course of study lies beyond the range of the studies taught in these institutions; and its requirements are adapted to maturer minds and more advanced intelligence.

Tuition in this institution is free. Professor Fernald states that board has generally been $3 a week; there has been no charge hitherto for room-rent, and each room has been provided with a bedstead, a husk mattrass, a table, a sink, and four chairs, without charge to the student. Two students occupy one room. The charge for washing and fuel has been 50 cents a week, making the whole charge $3.50 a week. Besides this the student has to furnish himself with books, usually ranging in cost from $10 to $15 a year. The incidental expenses have been from 50 cents to $1.50 per term. As an offset to this, the student labors three hours a day, for which he receives compensation. When the institution went into operation, the proposition was to pay 25 cents for the three hours' labor. About a year ago the rate was increased to 30 cents. That is the maximum price, and the rate is graded according to faithfulness and efficiency. This will yield the student, at five days in the week, $1.50 per week toward canceling his bills; or if he attains the minimum price, 8 cents per hour, it would be $1.20 per week. During a vacation of ten weeks in the winter, the students are allowed to teach, and a majority of them avail themselves of the opportunity.

In his elaborate essay on the subject of orchards and fruit-culture, Mr. T. S. Gold gives thorough instructions for the planting and successful

rearing of fruit-trees. He says that in the planting of an orchard the first and most important subject which should demand attention is the condition of the soil and its fitness to grow trees and fruit. The most essential thing is that it should be dry—that the trees planted upon it may have what is called a dry bottom, and not stand with wet feet. Where there is no hard-pan underlying the soil artificial draining is not necessary; but where this is the case it is absolutely essential to the successful culture of fruit that the land be artificially drained, so that the water can flow off freely, and not stand about the roots of the trees. Usually deep cultivation with some crop, corn, potatoes, or other hoed crop which admits of high manuring and requires it for success, is the best preparation of the soil that can be made. On rocky, fertile hillsides this culture cannot always be adopted; but upon any land that is susceptible of cultivation, there is no other method of preparing so cheaply or easily as to put it through a course of cropping of this kind. In planting, the work should be well done. Particular attention should be given to the size and shape of the holes for the trees. The size, in well-prepared soil, should be large enough to accommodate the full spread of the roots of the tree that it is designed to plant. It should be highest in the middle, and gently sloping towards the exterior. The tree, then, naturally and most favorably adapts its roots to this position. Prepare the roots by cutting off every wounded part with a sharp knife, in a slanting cut, and prepare the top by the removal of at least half of the last year's growth. As to the age of the tree the writer prefers those two or three years from the bed in the nursery, as they have much better roots and less top. In selecting trees from the nursery, select those with well-balanced roots as well as those with well-balanced tops. Orchardists should always select those varieties which do best in the immediate vicinity of where the new orchard is to be located. The best season for planting is still a debatable question, but if the fall is chosen the planting should be done early, so that the little granulations may form upon the roots, and the plant become adapted to its position before severe weather. The roots of a tree in its transportation from the nursery, and while being planted, should never be exposed to frost. If carefully wrapped and covered with moss and earth they may endure this exposure, but there is a damage to the vitality of the tree if only a part of the roots are frozen. If possible the roots should always be kept moist, so that all the little fibers, which are exceedingly delicate, may be preserved. In planting, carefully work in about the roots with the hand fine pulverized mixed soil, just such soil as is produced by the culture of the field in corn or potatoes for a year or two, at the same time very gently shaking the tree. After spreading out and carefully covering the roots with a few inches of this soil, the operation will be very much facilitated by pouring in a few quarts of water, and allowing the earth to settle before filling up the hole. This is preferable to planting during rainy weather.

Should an orchard receive any culture? The circumstances of location, strength of the soil, products of the farm, facility of obtaining manure, and various other points, come in here for consideration. Mr. Gold says his practice has been, while the trees were small, to cultivate with some low, hoed crop, potatoes, roots, or something of that kind; but he insists strongly upon leaving plenty of room about the tree that is not planted with any crop. After the trees have attained some size, unless the culture is very careful and guarded, they are often as much injured as benefited by it. If the land is laid down in grass, pasturing is advised rather than mowing—pasturing with sheep and swine, if possi-

ble; with larger animals only when the trees have attained sufficient size so that the branches are in a good degree above their reach. The advantage in pasturing over any other system is that all the fallen fruit, during the whole season, is consumed by the animals, and with it the insects which are the great enemies in orchard culture. Mr. Gold says:

I had an orchard of full size that had been plowed, cropped, manured, and mowed—always carried through such a succession of crops. The trees were getting old and seemingly becoming valueless. About six years ago I turned it out for a cow pasture, and my herd of cows preferred to lie there rather than in any other part of their range. The result has been marvelous. The trees have assumed a rich, healthy green, the foliage has come out luxuriantly, and holds on well in the autumn, and the growth of fruit has been in every respect satisfactory. I pastured it until some time in July, and then shut it up, as the weight of the fruit begins to bend down the branches, until the fruit is gathered in autumn. One of the difficulties connected with mowing an orchard, although you top-dress it to restore what you take off, is that the sudden removal of a growth of grass at that season of the year changes the condition of the roots so much and so suddenly that it does not seem desirable for the growth of the tree.

Mr. Gold advises the selection of trees without forks, as one side of such a tree is almost always sure to get the advantage, and it will split down. Take a tree that branches out evenly at the head, where it is desired the branches shall start. The practice of allowing trees to branch out close to the ground is not recommended. The objection is that the fruit on those lower branches never acquires the color it does higher up. It is apt to be spotted and marked with gray mold and mildew, more than where there is a freer circulation of air about the tree. He advices but little pruning. Once a year the trees should be looked over, but excessive pruning should be avoided. The mild days of winter, when labor is not in very great demand, are regarded as good as any for pruning. The limbs should be taken off with a smooth, clean cut, just close enough to allow the wound to heal over without leaving an unsightly scar upon the branches.

The writer thinks that the cold, wet soil, in which too many orchards have been planted, is frequently the cause of the curling of the leaf and the decay of the outer branches. The remedy for this would seem to be the sinking of additional drains. In a discussion which followed the reading of this essay, it seemed to be the prevailing opinion that the proper distance for setting apple trees was from 30 to 40 feet apart—40 and even 50 feet being regarded by many as none too great a distance between the trees.

Mr. Gold was followed by Mr. S. F. Perley, a successful fruit-grower of Maine, in an address of great interest. After indorsing most of the propositions advanced by Mr. Gold, he said:

After the trees get large enough to take care of themselves, it becomes a pretty serious question what we shall do. My judgment is—subject to change when I see reason to change—to run the orchard to grass, and pasture it with sheep. Other things will do; but calves are dangerous—hogs are dangerous. They bark the trees, and so will sheep sometimes, if you pasture too close; but take it all in all, I had rather have sheep in my orchard than any other stock; they manure it more evenly—they enrich it in a peculiar way. There is someting in the old saying, that "sheep leave golden tracks." I know they manure a piece of ground better than any other stock. Allow me again to cite my own experience here. I have an orchard of a little over four acres, one which my father had plowed and planted, and mowed and hoed, as Mr. Gold treated one on his farm. When I took the farm the orchard was run out, and for ten years I hardly got $10 profit out of it. I undertook to cultivate it. In plowing, the roots would stick up all about. It was terribly discouraging. I manured it, but still the apples did not come. Going into that field one day when it was in potatoes, I made up my mind I would never put the plow into that orchard again, live as long as I might, and I left the potatoes in the hills. I never again put the plow in, but left it to grow up to grass, if it would. I did not care much whether it would or not. Little or nothing has been done to it since, except to pasture sheep. I turned in half a dozen

at first, and in four or five years increased them to twenty or twenty-five. Now for the result. The sheep were turned on in 1856; no account was taken until 1860. Then I got 620 bushels of apples. There are 260 trees in the orchard. In eleven years, from 1860 to 1871, I harvested 6,417 bushels from those acres, which brought me $5,046.66, exclusive of some which I made into cider, leaving me a net profit, over and above expenses, of $4,598.79. I have charged the cost of fencing, the cost of the little manure I put upon it, and the cost of some underdraining that it needed. I have charged 8 per cent. on the estimated value for rent and taxes, and over and beyond all those expenses that piece of land has paid me $4,598.79; more than $100 a year profit per acre; and all I did was simply to turn it to pasture, putting in sheep. I do not think I put on $20 worth of any other kind of manure. The trees have averaged only $1.85 per year. That looks small, but when you take the aggregate it foots up very satisfactorily. It is more profitable than any other farming I do. I will state that last year there were only 60 bushels of apples in that orchard, so that some other years yielded pretty heavily; one year, 1,002 bushels, another, 1,025, and another, 704 bushels.

I have in my mind another treatment of an old orchard which I saw in New Gloucester. The soil was very similar to this—good orchard land. The owner had recently put in a team strong enough to carry the plow right through at considerable depth, and I never before saw so many roots sticking out. It was hard treatment. I did not see it again for five or six years; but when I did more than half the trees were dead and gone. It will not answer to plow an old orchard and break off the roots in any considerable quantity; they need their roots. The better mode is to improve the land by top-dressing.

During the evening session of the board an excellent scientific and practical treatise on the subject of the "Management of meadows and pastural lands," was read by Mr. John Stanton Gould, of New York. In his introductory remarks Mr. Gould speaks as follows of the general characteristics and habits of the grasses:

A practical examination of the grasses will show that they vary much in their characters, their habits, and their nutritive values; some of them flourish on sandy or rocky soils, while they speedily perish on wet ones; others flourish vigorously in wet soils, while they speedily die in a dry one. Some will grow in alkaline soils, and of these a portion requires a soil abounding in potash, another needs lime, and another can only grow in the presence of soda. Some of the grasses flourish most in the brightest sunlight, while others rejoice in the shade; some are best adapted for hay; others, useless for hay, are extremely valuable for pasture. Some lands are forced into great luxuriance by one kind of manure, which will operate almost like a poison upon other varieties. One kind abounds in that species of nutriment which strengthens the muscles; another, ill-adapted and indeed quite inoperative for strengthening the muscular tissues, will lay on fat rapidly; another, which is quite deficient in both these respects, is rich in those elements which serve to support respiration and furnish the fuel from which animal heat is eliminated. A variety of grass possessing these qualities in a very slight degree, may yet be very useful in combination with others if it assist to assimilate the nutriment contained in them with the tissues of the animal containing it; in other words, it may act as a tonic, a dissolvent or an adjuvant. In view of all these facts, it will be clear that in the judicious selection of different varieties of grass to occupy different localities, and to subserve different purposes, a wide field is afforded for the application of physiological, botanical, geological, meteorological, and chemical knowledge. Every variety of grass was intended by the Creator to serve some valuable purpose. It is the business of practical agriculture to find out what that purpose is, and to place it in the locality and under the conditions best suited to its most profitable development.

Hundreds and thousands of acres of land are taken up by grass in this county, yielding the most meager returns, and scarcely paying for the labor of gathering, because it has been seeded with a kind of grass ill-adapted to its capacity. If you only seed these lands with the proper kind of seed they will at once give remunerative crops. For example, the *Danthonia subspicatum*, although not so valuable for fodder as some other kinds, yet will grow on clay grounds where timothy will not flourish; and the same remark is true of the *Cynosurus cristatus*, or crested dog's tail. Surely it is better to sow such grasses as these which yield some profit than to have the land naked, or to allow its occupation by noxious weeds. It is impossible, in the present state of our knowledge, to say with certainty what species of grass is exactly adapted to any given soil or situation. We cannot look upon this knoll, or that intervale, or yonder plain, and say this grass will grow better and prove more profitable if sown here than any other. But we can say, without hazard of contradiction, that for every spot on earth there is a grass or combination of grasses which is better adapted for profitable cultivation than any other, although we cannot say exactly what it is. If farmers were more familiar with the several species they would recognize this truth more fully, and thus

be prepared to contribute original observations to the general stock of knowledge. If, for several years in succession, you carefully observe the soils and situations where each variety grows most spontaneously and with the greatest luxuriance, and furnish the result of your observations to some respectable agricultural journal, we shall soon have a mass of reliable and accurate facts in relation to this matter such as has never yet been brought together. Practical men will then have some reliable guidance, and will not be obliged to grope in the dark about their grass culture as they have hitherto been compelled to do. You must remember, however, that your statements, if they are to be useful, must distinguish the plants by their botanical names; there is so much confusion in the trivial names that their use will lead inevitably to the most serious errors in practice; thus some half dozen species are known in different localities by the single name of June grass, as many more are called blue grass, a number more are called spear grass, another number are called reed grass, &c.; hence a man in one section of country writing his experience of June grass, or blue grass, or spear grass, will grievously mislead a farmer in another section who knows an entirely different plant, having different habits and requirements, by that name.

The writer then proceeds to state the following important facts:

First. It appears that the grasses, which in the present state of our knowledge are the most useful and the most profitable, seem to flourish best when the opposite extremes of wetness and dryness are avoided. Very careful counting in a great number of meadows, give the following results: In wet meadows, out of thirty plants, four were useful and twenty-six were useless; that is, they were weeds. In dry meadows, out of thirty-eight plants, eight were useful and thirty were useless. In moist meadows, out of forty-two plants, seventeen were useful and twenty-five useless.

Second. In a rough classification of soils into upland thin soils, poor clay, rich loams, flooded meadows, and irrigated meadows, the following figures, which give the average of a great number of careful observations, will show the relative values of each kind of soil. The "upland thin soils" were in all cases the poorest grass lands; the "poor clays" gave 50 per cent.; the red loams 150 per cent.; the "flooded meadows" 250 per cent., and the "irrigated meadows" 400 per cent. more than the "upland thin soils."

Third. The soil which seems best adapted to the production of our best grasses is a strong, deep calcareous soil resting on a clayey subsoil. On such a soil we may be sure of an abundant vegetation resisting drought and heat and making a fine desirable sod; but you must not forget that there is no soil which is incapable of bearing grass if we only select the variety best adapted to it, and bestow upon it the treatment most suitable to it. By effecting physical and chemical alterations in the soil, we may adapt it to the production of almost any kind of grass; but as this is an extensive and tedious process, most farmers will prefer, at least in the first instance, to suit their grasses to their soils, rather than the soils to the grasses, but we should keep the amelioration of the soil steadily in view so as at length to fit it for the production of the most valuable kinds.

Mr. Gould states that if soil is prepared thoroughly and made as rich as manure can make it, and sown so thickly with any one kind of grass seed that the seeds will actually touch each other, it will be found that after germination many of the young plants die out, leaving certain interspaces of unoccupied soil between the plants which still live. These interspaces may be filled ever so often with fresh seed, but a like result is sure to follow. It is impossible to fill them with the same species, as the living plants will not tolerate any neighbors nearer than a fixed distance—a distance determined by the greater or less abundance of the specific food required by the particular species of grass cultivated. If with a given amount of this food, the plants will grow within three inches of each other, as the amount decreases they will require intervals of six, nine, twelve inches, and so on. Each soil has therefore a capacity for bearing a maximum number of plants of one variety of grass, which can under no circumstances be exceeded. If, then, these unavoidable interspaces be sown with the seeds of another species of grass, a certain number of its plants will grow and the remaider will die after germination, as before; the plants that grow will not interfere with those of the first variety, and the crop will be materially increased. Still there will be spaces of unoccupied soil, and the ground will not be thoroughly turfed over until from five to twenty varieties are growing upon it. Experience has shown that any soil will yield a larger and more nutritive crop when

sown with from five to ten species of seeds than when only one or two are growing. Animals flourish much better on mixed grasses than they do on a single species, however nutritive that species may be. The animal tissues require numerous elements for their support, and these elements are furnished in greater abundance, and are better adapted for assimilation by a mixture of dissimilar grasses. Nature teaches this doctrine very clearly, independently of theoretical considerations. The horse, when at liberty to choose, will always leave the single one for the mixture. On a very rich old pasture, which fattened one large ox and three sheep per acre, one thousand plants stood on one square foot of ground, of which nine hundred and forty were natural grasses, and sixty were creeping rooted clover and other plants; there were twenty distinct species of plants on this square foot of ground. To quote Mr. Gould's own language:

On a well-managed water meadow there were on a square foot one thousand seven hundred and two plants of the natural grasses, and ninety-six of the clovers and other plants. Now compare this wonderful luxuriance with the produce of an equal space of land with a single species of grass. A single square foot where nothing but narrow-leaved meadow grass (*Poa angustifolia*) grew, contained one hundred and ninety-two plants; of meadow fox-tail, (*Alopecurus pratensis*,) eighty-two plants; of rye-grass, (*Lolium perrene*,) seventy-five plants. Compare seventeen hundred and ninety-eight with seventy-five plants to a square foot and you will at once see how desirable and profitable is the sowing of a great variety of seeds. You will see how much is annually lost to the country for the want of a greater variety of plants in our meadows and pastures, for the farmers in the United States who sow more than two kinds of seeds might be comfortably accommodated in a moderately-sized church.

The writer thus condemns the common practice of sowing grass seeds with some kind of grain:

Most farmers are accustomed to sow their grass seeds with some kind of grain, and many defend the practice on principle, but I think the preponderance of evidence is clearly and unequivocally on the side of those who advocate separate sowing. The practical results have almost invariably been in favor of this method when it has properly been done, and theoretical considerations would most certainly lead to this practice. The grain crop abstracts from the soil a large portion of the nutriment which is needed exclusively by the young grass. Every plant of grain occupies a place to the detriment of the expected sward; much injury is done by the lodging of the grain when beaten down by heavy rains. The young plants are repressed in the spring by the shade of the grain when they most need the genial influence of the sun, and then when the grain is cut it is exposed in its weakened state to its fiercest summer glare, at a period when it is more exposed to drought than at any other season of the year. This perfect coincidence between the teachings of science and the results of practical experience, fully justify me in the opinion I have just given, that grass seeds in most cases should be sown by themselves. Another cause of the failure of grass seeds to germinate, is the damaged condition in which they are received from the seedsman. It must be borne in mind that different species of grass vary greatly in their ability to form good seed, a large proportion of the most carefully secured crops proving abortive; thus, orchard grass is very apt to prove defective, perennial red clover has frequently abortive seeds, and the seed of the meadow fox-tail is, as a general rule, so bad that only one seed out of three will germinate.

In reply to a question as to what kind of top-dressing should be used, Mr. Gould said:

That depends entirely upon the peculiarities of the soil. A man is simply a quack who stands up in a meeting of this kind and pretends to say what is the best manure for any particular soil. The great principle to be observed in manuring is to restore to the soil the missing elements which were in it. If there is a deficiency of lime in the soil, then calcareous manures, chalk, lime, and plaster are the manures best adapted to restore it. If the deficiency is in phosphates, give phosphatic manures; give ground raw bone; give good superphosphate of lime; give it in any form that will restore phosphoric acid. If the deficiency is nitrogen, give sulphate of ammonia or nitrate of soda, or anything which contains it. First find out in what the soil is deficient. Chemistry will give you light, but if you want to learn in a practical way what manure is best adapted to your soil, do as I recommended you to do, to ascertain what

kind of grass is best adapted to your land. Measure off eight or nine square rods of your meadow or pasture, and on one of them put phosphate, on another plaster, on another ashes, on another lime, on another nitrate of soda, and so go on with the different kinds of manures, the action of which you want to investigate on the grass, leaving one of the squares without any manure whatever. Mow off from each square rod on the same day the amount of grass that has grown upon it, and weigh it in a green state. But do not decide yet; let all be converted into hay. Do it carefully: do it with your own hands, if necessary, only be sure that none of the hay from one of the squares is mixed with that of another square; then when your grasses are thoroughly dried, (let them all be equally dry,) weigh each portion, and the whole story is told you at once. If you find that one kind of manure gives you four pounds of hay more on your rod than that which was unmanured, then you know that four times 160 will be the amount of extra hay got from an acre by the use of that particular manure. You know what you can sell that extra hay for. Suppose 500 pounds is the result; you know what 500 pounds of English hay will bring; then calculate how much it will cost to put that manure on 160 square rods, and the measure of profit is given you, as it can be in no other way. In that way you will learn precisely what kind of manure your soil requires, and you will also learn what you can afford to pay for any kind of manure whatever.

In a discussion which followed the reading of this essay, Mr. Horace Colburn gave his experiments in grass-culture on reclaimed swamp lands, as follows:

Wherever I have traveled in Maine, I see a great portion of the best grass lands covered with bushes and other obstructions to culture. Whoever has taken notice the last year, may have seen a good crop of grass on what we call reclaimed swamp lands, while you could count the gravel stones at a distance on the uplands, and, in some places you could see countless grasshoppers also. Some farmers object to swamp lands because they say they cannot raise the better grasses on them, and that the varieties of swale-grass are good for nothing. But the present year will be sufficient to convince them to the contrary. We find those who have those grasses have no difficulty in getting them all eaten up, and to good advantage. In 1839 I purchased the farm, or a portion of it, on which I now live. The soil is mainly clay loam, through which runs a small stream that empties into the western branch of the Sheepscot River, on each side of which was a strip of interval, varying in width from two to twenty rods, and for that width it was covered with alders, elder bushes, and with almost anything that could drift upon it. Wherever the bank comes down steeply toward the brook, the former occupants had hauled logs from the highlands and dumped them on to the interval, and it looked like rather a hard job to clear the piece. After I moved on the farm, it began to be whispered around that I had bought Mr. such-a-one's bog, and much wonder was expressed that I had not bought more upland instead, so that I could raise more grass and corn. It was a good hay season, and all the hay cut was judged to be twelve tons. I bought it at that estimate, but do not think there was so much.

When a suitable time came, I commenced at the lower end of the bushes, cut them out by the roots, cut and cleared off the logs, and, where it was not springy, I plowed and seeded to English grass; where it was, I let the water grasses remain. I have cut grass on some of it for more than twenty years, and it has averaged two tons to the acre. The hay cut now is finer than when I first mowed it, and by following up these places I have been able to increase the quantity of hay upon my farm from twelve to seventy or eighty tons, until within the last two years. But these intervals and swales have not fallen off in quantity in these years when the upland has not yielded a half crop. By clearing these waste places I am enabled to keep up the fertility of the uplands. The sediment left after being overflowed keeps them enriched sufficiently to produce an even crop of grass without any other dressing.

Mr. Sylvanus Poor made the following statement:

My farm contained a large amount of such swampy land. I had several acres in a body lying between my house and interval that I wanted to improve. After taking off the bushes, which cost $7 per acre, I dug a ditch through it in the best place to drain it, from 3 to 4 feet deep, and 3 feet wide at the top, at about right angles with the banks of the upland. This main ditch was left open until all the rest were finished. I then dug two others, one on each side of the main ditch, at about right angles with it, and about the same size and depth, near the ridge, in the best place to receive the spring and surface water. In these, for want of draining tile, I used, for one side, small poles, (ash and cedar,) beginning, in all cases, at the upper end, to lay my drain, being careful to keep the water course clear. On the other side I used brick and flat stones. After making them comparatively tight, I filled in with coarse sand or gravel to within 8 or 10 inches of the surface, so as not to disturb the sand with the plow when plowing. This method takes not only the spring, but the surface water readily. But this

did not fully accomplish my object, for I found springy places on both sides of my side ditches; I then dug two other side ditches parallel with the first ones, and not finding much water, I filled them at once with coarse gravel from the bottom to near the surface, and found that they took the surface water readily, but did not drain my land sufficiently; I then dug smaller ditches (but about the same depth) from the side drains to wherever I found a spring on the ground. These I filled at once with coarse gravel, as before described, unless there was too great a flow of water; in that case I laid underdrains, and filled as before. In this way my object was accomplished, and I can now raise on land that was worthless and barren for good crops, corn, potatoes, turnips, wheat, barley, and oats, and the best of English hay, and get large crops.

Since then I have done more at improving the same kind of land on other parts of my farm, and have learned something from experience. Now, I dig the main ditch in the best place to drain the land, and sometimes more than 6 feet deep—it being very important to have the main ditch deep enough to thoroughly drain. I then make side ditches from my main ditch to wherever I find a spring or very wet place. These ditches I fill, as before described, using judgment as to whether an underdrain is required, or whether the coarse sand will answer alone. I prefer to use sand from a sand beach at the river, as water passes through it readily. After draining such land, and it becomes settled and comparatively hard, I find it for my interest to plow and cultivate it, for the purpose of improving the quality, as well as the quantity of the hay. There is an acid, or something of the kind, in most of such cold, mucky land, that is injurious to vegetation; but exposure to the atmosphere will remove it, although sometimes it takes several years.

I had a small piece of swampy land, lying at the foot of the bank, so wet and soft that I could run a small pole into it 8 or 10 feet very easily. After taking off the bushes, &c., and ditching near the ridge so as to take away the spring water, I sowed herdsgrass and fowl meadow seed, but it would not produce anything of value; I then top-dressed, and sowed on seed with the same result; the seed sprouted and came up, but it soon withered and died. This was the second year after ditching. I supposed I knew why the grass would not grow, and let the land lie. The fourth year fowl meadow began to grow, and the fifth year I had a heavy crop of herdsgrass and fowl meadow, and the land has produced bountifully ever since, which is seven or eight years.

An interesting discussion on the subject of the best breeds of cattle for the production of milk was followed by an essay from Mr. L. L. Lucas, on "Common Errors in Rearing and Feeding Farm Stock." In the course of his paper Mr. Lucas states that the farmers of Maine cannot raise stock exclusively for beef purposes except at a loss. In this respect they cannot compete with the West. This being the case none but the better breeds should be raised, and they chiefly for dairy and working purposes. While a good cow, bred from a pure blood male, will bring $100, a common one will bring only $25. There is not this difference in the cost of raising—that indeed, would be in favor of the improved breed. The best calves only should be retained, and they should be kept thriftily growing until they are grown or disposed of. When they cease to grow, unless they are at work or giving milk, they are kept at a loss.

Among the more important errors pointed out is that of overstocking pastures, requiring too much exercise and hard work on the part of the stock to get a living. When not intended for market, cattle from these overstocked pastures are taken to the barn in the fall in poor condition, and are generally put through the winter upon straw, meadow and swale hay, cornstalks, &c., late cut, with no provender, and often sheltered in barns as cold as an orchard. One of the greatest mistakes among farmers is in keeping their stock in cold stables. From an estimate based upon satisfactory experiments, he states that the extra expense of keeping ten head of grown cattle sixty days in extreme cold weather, badly sheltered, will finish up a stable roomy enough to accommodate them, and made as warm and comfortable as an ordinary sitting room without fire. Another common error is the feeding of rough fodder, such as cornstalks, straw, and swale hay, late cut. The large bulk of such fodder is fed just as it comes from the mow, and nothing but ex-

treme hunger and cold will induce cattle to eat it, and then only in quantities sufficient to keep them from actual starvation; whereas, if it could be cut fine, wet with warm water, or even with cold water in moderate weather, and a small quantity of Indian meal, shorts, or fine feed, mixed with it, it would be greatly improved and eaten with nearly as much avidity as common English hay, and furnish about as much nutriment.

Still another error is in allowing hay and grain, including corn, to stand from eight to ten days too long. When this is the case the straw and stalks become dry and woody, and almost worthless as fodder; and the grain, although it may measure rather more bushels, is worth much less to feed to either man or beast. Grain is good in proportion as the straw is green and good. Wheat must be cut at the proper time, otherwise it is injured, the same as hay. Corn should be cut and shocked as soon as it turns fairly yellow, and allowed to ripen in the shock. So ripened it does not shell from the cob so easily, but it is more nutritious, and in every respect a great gain.

Mr. Thayer spoke of the relative value of different kinds of food for stock cattle and milch cows. He said:

Of late years I have kept some cows for the sale of milk. I wanted to know what it would cost to keep them. By careful experiment and actual weighing, I found that 20 pounds of good hay would keep a cow better than they are usually kept. For winter milk it is necessary that some provender should be given in addition to hay, and I began with the impression that 10 bushels of corn was as good as a ton of hay, and fed accordingly. I soon found out my mistake, and lately, when hay was scarce and I wanted to get along with as little as would answer, and make up the necessary food with meal. So I went on the supposition that 20 bushels of meal were equal to 2,000 pounds of hay; but I found that that was not enough. Then I hunted up what the books had to say about it, and I found it stated that it required 64 pounds of corn to be equal to a hundred pounds of good hay. That just about agreed with my experience, and I afterward so stated at a meeting of our club; but nobody agreed with me at first. We had some pretty lively discussions about it. Finally I weighed out 10 pounds and 20 pounds of hay, and meal equal to 10 pounds of hay, reckoning 10 bushels and 15 bushels and 20 bushels equal to a ton of hay, and set them before them. When they came see the different messes as actually weighed out, they all came over to my way of thinking.

Mr. James A. Lawrence said:

I have a horse weighing about 1,200 pounds. I give him 12 pounds of hay and two quarts of scalded meal in the morning, a quart of oats at noon, and at night two quarts more of scalded meal. So far, this allowance has kept my horse in good condition, sleek, smooth, and bright. My cows are half Durham and half Ayrshire. To my older animals I give 12 pounds of hay per day, two quarts of scalded meal in the morning, and the same quantity at night; and my cows in milk never have given more in winter than they do this winter. My younger stock, three years old, two years old, yearlings and calves, I feed about in that ratio. I have two or three full blooded Ayrshires, which will be a year old next spring. I am giving them five pounds of hay per day and one pint of oats, and they are sleek and handsome. My hay is chiefly timothy and red top, and was cut before it came into the second blossom, and cured in the best possible manner, bright, handsome, and aromatic.

Mr. John Stanton Gould said:

I have found great difference of opinion with regard to feeding, and the amount of food necessary for keeping animals, and I resolved to go to headquarters. I spent considerable time in the city of New York visiting the horse-railroad stables in that city and in Brooklyn, and the omnibus horse stables, in order to learn their experience. I found those in charge very courteous. They opened their books and gave me every information desired. To sum up the results, looking over the record of their experience for several years, I found that they had all settled down, each company for itself, as the result of careful and repeated experiments, the details of which I was privileged to observe, upon one uniform rule for horse-railroad horses, and that was, 12 pounds of hay and 16 pounds of Indian meal per day. In that way a railroad horse was kept up to his highest condition, and they were enabled to do their work more satisfactorily than under any other system that had been tried. Oats had been repeat-

edly used as an article of food, and their cost was carefully compared with that of Indian meal. It was found at one time, that during the hot weather the feeding of this amount of Indian meal would be found injurious; but the result of their experience was, that Indian meal, on the whole, for a railroad or omnibus horse, was the true thing. But they have one very curious practice, the reason of which I am unable to fathom, which I ought to state in connection with this, as possibly bearing upon the subject under discussion. They invariably water all their horses at 1 o'clock at night. They have an idea, how true it is I do not know, that watering their horses at night adds greatly to their power of digesting food, and prevents injurious consequences.

Many additional articles of great value are contained in this report, but a lack of space forbids further notice of them.

The eighteenth annual report of the Maine State Board of Agriculture for the year 1873, contains some 500 pages, The winter session of the board for this year was held at Winthrop, commencing on the 14th and ending on the 17th of January. The meetings were well attended, and much interest was manifested in the addresses and discussions.

In his introductory remarks, Secretary Boardman states that as early as 1787 an agricultural society was established in Winthrop, the first of the kind in New England, and the second in all North America. This society, under two or three different names, has maintained its organization to the present time. In the early years of its existence the officers of the present society carried on an extended correspondence with the leading farmers of the country, and as early as 1826 imported 25 bushels of seed-wheat direct from Gibralter, Spain, which was distributed among the members of the society. In 1834 it imported oats from Scotland. The first agricultural paper in Maine was also started in Winthrop in 1833, called the *Kennebec Farmer*, which name was afterward changed to *Maine Farmer*.

Mr. John May, in his address of welcome to the members of the board, also took occasion to revive many interesting facts connected with the early history of Kennebec County and the town of Winthrop. Winthrop was settled in 1765, and was long known as Pond Town. More than three quarters of a century ago meetings were held and an association formed at this place, the object of which was to elevate the laborer and the calling of the husbandman. No record has been preserved of the discussions and doings of this ancient association; but the results were so satisfactory and gave such promise of success in the future, that the members were induced to apply for an act of incorporation, which was granted by the Legislature of Massachusetts, February 21, 1818. Alexander Belcher, Peleg Benson, David Foster, Charles Harris, Dean Howard, Nathan Howard, Joseph Metcalf, Issachar Snell, Joseph Tinkham, Enoch Wood, Elijah Wood, and Samuel Wood, were the incorporators. The first meeting was held on the 4th day of July, 1818. Its officers were Samuel Wood, president; Nehemiah Pierce, vice president; Joseph Metcalf, corresponding secretary; Alexander Belcher, treasurer; David Thurston, Peleg Benson, Issachar Snell, Joseph Norris, and David Foster, trustees. After an existence of fourteen years, in order to enlarge and extend its influence, the name of the association was changed from Winthrop to Kennebec Agricultural Society, and in March, 1832, the Kennebec Society was formed under an act granted by the Legislature of Maine, with Samuel Wood for its president; G. W. Stanley, vice president; Elijah Wood and S. Benjamin, secretaries; Samuel Chandler, treasurer; William C. Fuller, collector; Samuel P. Benson, Elijah Wood, and Nathan Foster, trustees. The valuable information obtained and disseminated by this society soon gave great celebrity to the farmers of Winthrop, which they have maintained up to the present day.

On the second day of the meeting, Mr. Silas Hawes read a paper on the advantages of mixed husbandry. He affirmed that no one crop was safe enough for a specialty. The superior state of farming in England is due to a systematic rotation of crops, but if a specialty in any crop is followed rotation cannot be practiced. In mixed farming, if one crop fails, the climatic conditions that caused the failure are auspicious for the perfection of some other. A wet season that produces a good hay crop, militates against the potato crop; a dry season which perfects the potato crop, cuts off grain and hay to a considerable extent. The fruit crop is more noted than any other for fluctuations. Dairying, to be pursued with profit, depends on the seasons, the production of forage, and so on to the end. All that is not produced must be bought, and often it has to be purchased at rates greatly above its cost of production. He continues:

Prices of labor will not admit of economically engaging in specialties. If our farming operations exceed a certain range, we must hire help. If we have more to do than we can perform ourselves, we must have extra labor. This labor is costly and must be paid for; and to get money to pay it we must sell some product. If we run specialties and they fail, we are unable to pay. If, on the other hand, we adhere to mixed farming, and one crop fails, another is good; and if one falls below an average, another rises above, so we maintain the equilibrium and have a surplus to sell, of some kind, and the laborer receives his hire.

Following the paper of Mr. Hawes was one on the subject of "Changes in our Farming," by Mr. Z. A. Gilbert. The writer, after alluding to the progress made elsewhere, says that the general features of farming in Maine have changed but little during the past twenty-five years. There is a gradual decrease in the amount of production per acre, and notwithstanding the increased demand for many of the productions of the farm and garden, he does not think farming pays as well now as it did a quarter of a century ago. Farmers seem loth to depart from the old beaten track, and hence are being greatly distanced by the more scientific and progressive farmers and gardeners of other States. He urges more attention to market-gardening, and thinks that the farmers of Maine may look to such productions for a solution of the question, "How to make the farm pay." On this subject he says:

Can any one frame a reason why we do not raise our onions instead of purchasing them abroad? Owners of land in Massachusetts find it a money-making business to grow onions on land worth five hundred to a thousand dollars an acre, the soil of which is far inferior in productive capacity to ours, with help costing more than it costs among us, and transport them down to Maine to supply the owners of these cheap lands with this highly-prized vegetable; yet it is proved beyond a question that onions can be grown here as well as in Massachusetts. All that is needed is Massachusetts skill worked into Maine soil—refining our rough potato culture, and changing it to the smaller limits, nicer work, and more nursing of the onion bed. With skill, forethought, and that unremitting attention which insures success in any undertaking, the onion is as sure to bring its returns as is the potato. We should then not only supply our own wants, but also contribute largely to the demand in the larger markets of New England. The town of Westport, Mass., grows annually from three to four hundred thousand bushels. The average yield per acre is put down at 500 bushels; and the greatest yield at 1,000 bushels from a single acre. I have in my pocket a certificate, signed by two reliable men, certifying that they pulled and weighed a crop of onions grown upon one-fourth of an acre in Androscoggin County, and found the same to be 392 bushels—52 pounds to the bushel—or at the rate of 1,568 bushels to the acre. "I tell you," says the enthusiastic grower, "in order to make our farming pay, we must reduce the fields and enlarge the onion beds." Figuratively applied, the expression is a significant one.

There are still other new enterprises which have been pursued among us to an extent sufficient to prove their profit, but not to an extent to attract attention from farmers generally. We are annually paying a hundred and fifty thousand dollars to Boston pickle dealers for the one article of pickles. Lewiston and Auburn alone purchase 1,000 barrels of cucumber pickles, exclusive of those put up in jars, at an average

price of $14 per barrel. These are all grown and put up in the county, and probably no other city in the State can boast of a supply of home-made pickles. Few people are aware of the extent of this pickle trade among us. Those who are engaged in growing the cucumbers and putting up the pickles find the business profitable. An average crop is one hundred barrels to the acre, worth in the grower's hands $5 per barrel.

Mr. Horace Colburn read a paper on the subject of the "Management of Dairy Cows," which was followed by a protracted discussion as to the best feed for milch cows. Mr. Atherton said he kept a good many cows for milking purposes, and generally fed them with grain and shorts; had also raised corn-fodder, and fed it in a green state, but did not think he got the full benefit of it in that way. Mr. Snell stated that two or three years ago, in taking the census, he had procured some statistics which did not look very favorable to the dairying interests of this section of the State. He found that the average yield of butter per cow was somewhere between 50 and 100 pounds per annum. The cows generally were in a miserable condition. He had a cow in his own herd which would yield him 400 pounds of butter per annum. He feeds good English hay, with some little corn-meal, shorts, oat-meal, and roots, varying the feed occasionally. Two quarts of corn-meal per day, in addition to other food, is as much as a cow should be allowed to eat. During the present year he has kept his cows principally on fodder-corn—Southern corn, sowed. It grows rank, and yields eight or ten tons to the acre when dried. He runs this through a hay cutter and feeds it. In addition to corn-fodder, he gives each cow four quarts of a mixture of shorts and cob-meal per day. With this amount of feed he gets about one pound of butter per day from each cow. His experience is favorable to fodder-corn as a feed for milch cows. He dries it under cover, lets it remain two or three days to wilt, and then hangs it up in his barn. If hung on poles, or put up too loosely, it becomes so dry that the cows do not seem to relish it. If packed down after drying it will gather a little moisture, and when cut up, after being thus cured, cows seem to prefer it to hay. Mr. Smith thought sweet corn much the best, but the quantity raised on the same amount of ground was so much less than the Southern corn that he regarded the latter much the more profitable. He thinks fodder-corn, when properly cured, a good substitute for hay; when improperly cured, however, it makes very poor fodder. Mr. Grover said:

There is a query in my mind yet whether fodder from Southern corn is more valuable, at the cost, than sweet corn. I have tried both. It is more trouble to grow Southern corn; it is more uncertain whether you get a good yield or not; there is a greater amount grows on the ground, consequently it saps the ground more; and to my mind it is not certain that sweet corn is not more profitable, take it all in all. I think there is more milk in it, and I have come to the conclusion that I prefer to raise it to the Southern fodder-corn.

Mr. Cobb said:

I have experimented in raising fodder-corn for my cows, both in the fall and winter. I find that in the fall the fodder-corn helps out the pastures, but alone it will not keep up their flow of milk; they must have, in addition to this, some shorts and some meal. Until the last two years I have raised the Southern foddern-corn; for two years past I have raised the large sweet corn, and find that it can be raised to great advantage. This last year I sowed one-quarter of an acre, and from that piece, which was measured by a committee of three, and the crop weighed by the same, and presented at the county show for premium, I raised nine tons and eight hundred pounds of corn fodder—green. That corn fodder I consider worth more than any other dry feed that can be given to cows. In the first place, this fodder is so sweet when dry, that the cows will eat it up perfectly clean; they will not leave a stalk, even if it is an inch or an inch and a half through, and it will not be larger than that if you sow it thick enough. Our cows will give more milk from this sweet corn-fodder than from any other fodder we raise. We

give our new milch cows, those that came in this fall, four quarts of Indian meal and six quarts of shorts, with a foddering of this corn at noon. This is an extra quantity of provender, but we do not calculate to feed the best quality of hay. The nice hay is better for horses and oxen than it is for cows, in proportion to what it is worth.

In answer to a question, Mr. Cobb stated that he scalded his meal and shorts together, and after cooling it gave it to his cows quite moist. He gave his cows about one tablespoonful of sulphur each per week, with good effect. Salt should be kept in the shed or stable where the cows can have access to it at any time. He did not favor the practice of putting it in their feed and compelling them to eat it whether they wanted it or not. In regard to the steaming of feed, he said:

When my cattle came to the barn last fall there was plenty of room in it, but not much to give them, and consequently I had to economize and make the most of what I had. I had heard and read a good deal about steaming feed for stock, but I had no chance to steam it, as many do who practice it. I keep eight cows and two horses. I had a large box made, water tight, sufficiently large to hold the feed for my stock—either at night or in the morning. I fed them once in the morning and once at night with this steamed feed, and at noon with dry corn-fodder. This box I filled with chopped feed, mixed meal and shorts with it, then heated water in a boiler, brought it into the barn, and saturated the feed with it; then covered it tight so that it would steam six hours, at least, and let it cook all through—the poor hay, straw, meal, and shorts. That worked well. I found by so doing that I saved 53 pounds of hay a day on eight cows and two horses. I thought that was paying me something, and I found by so doing we could do our chores just as quick as we could when we fed in the old way. Then we tried the experiment of putting the feed into the box without chopping, steaming it in the same way, and it worked well. There was but a trifling difference whether the fodder was chopped or put in without being chopped. We practiced that until our cattle went out in the spring, and considered it very profitable.

At the conclusion of the reading of an essay by Mr. Alexander Hyde, of Massachusetts, on the subject of farm buildings, Mr. J. B. Walker, of New Hampshire, thus spoke of the importance of so constructing barns as to shelter manure:

We lose a great deal from the washing of manure, when out of doors, as well as by evaporation. My experience has led me to the conclusion that we want a tight bottom to our manure receptacle, as much as we want a tight roof overhead. When I raised my old barn, to put a cellar under it, I saw that the earth underneath looked damp and very rich, and I dug out and put away as manure, all that had the slightest tinge showing that it had been colored by the manure that had soaked through the floor. I have no doubt I had lost for years quite a quantity of valuable manure in that way. But when I got down to the clear sand, as white as the sand on the sea shore, I came to the conclusion that that was not good for anything, and I used it to grade up around my house, intending to spread some soil over it in order to make the grass grow. Very much to my surprise, this sand that I had taken from 2½ to 3 feet below the surface, that was entirely barren, as I supposed, threw up a rank growth of barn grass that lasted one year. I thought if it would bear barn grass I would wait and see what else it would bear. That barn grass went out the next year, and up came a growth of witch grass; and from that day to this, fifteen years or more, that ground has grown witch grass every year, without a particle of manure. What does this show? It shows that these fertilizers, particularly liquid manure, go down further than we have any idea of, and that we are losing more every year than we are aware of, by not having it in the bottom of our barn cellars.

On another branch of the subject, viz., the proper pretection of farm stock, Mr. Perley said:

Some fifteen years ago, having about twenty head of cattle on the south side of my barn, and being a little short of hay, I had to feed some grain, and the question came up in my mind what I should buy—corn-meal, shorts, cotton-seed, oats, or what? I thought the best way to settle that was to buy a little of each, and try it. I brought out my cattle, one at a time, weighed them, and set the weights down; this one is giving milk, that one is at work, and that one is doing nothing. After following that a few weeks, and trying the different kinds of provender, I settled down upon a principle in the matter of feed; but that is not what I was coming at. I kept a record of the thermometer at the same time, and found that when the average temperture for a week (taking three observations a day) was 18° below zero, it would take almost as much again provender to keep the cattle from falling away as it did when the average

for the week was 23° above zero. I learned from that that it is cheaper to keep my cattle warm with hemlock boards than with corn-meal, cotton-seed meal, or anything of the kind. * * * * I am satisfied that a warm tie-up will save a quarter part of the expense of keeping cattle. I was in a stable this morning where I saw that the man had adopted the plan of blanketing his cow, and I do not know but that is just as well. It is warmth you want, and you have got to supply it, either in fodder, shingles, or blankets, or in some other way. A certain amount of animal heat must be kept up. Beyond that you may go on making beef or fat.

Mr. Joseph B. Walker read a very interesting paper on the subject of plowing. At its conclusion, in reply to the question as to whether plowing under manure was the best way to apply dressing to land, he stated that it was necessary to do so on his lands to prevent it being washed away by an overflow of the river. But were not this the case, he thought it much the best plan. If the manure were plowed under to the depth of three or four inches, it would then be down about the proper depth to do the roots of grass, corn, and grain the most good. Manure that is left upon the surface is blown away and wasted, more or less; but should not this be the case, during a dry season it would do the roots of vegetation but little if any good.

Mr. Millet made a statement in regard to his experiments with the onion crop. His first attempt was with two ounces of seed. Selecting a piece of ground that had grown potatoes the season preceding, he manured and plowed in in the fall. In the spring he added additional fertilizers, and was rewarded with a moderate crop. He had sufficient for his own family, gave away some, and sent $20 worth to market. The next year he took the same ground, adding enough to make out one-eighth of an acre, plowed and fertilized it better than he had done the first year, and realized from his crop of onions not far from $200. The third year he took a portion of this eighth and lengthened it out to about one-fourth of an acre with a piece of wet ground that was rather full of weeds. On this quarter of an acre he hauled six cords of manure, spread it evenly, beat up the lumps, and plowed it in from five to seven inches deep. It laid thus through the winter, and in the spring a cultivator, with a weight, was put on, which cut it up five or six inches deep, and made it quite mellow. Twenty-five bushels of good dry ashes were then spread evenly over the ground and harrowed in; but even this quantity of fertilizers not being regarded as sufficient, 40 bushels of tolerably well pulverized hen-manure were added. When the onions were grown a committee measured the land, and found on one square rod 13 bushels and 11¾ pounds. The measurement was made accurately, and the quarter of an acre was found to have produced 392 bushels of merchantable onions, 52 pounds to the bushel. The soil is a deep loam, with a gravel bottom; hard wood ground—maple, beech, birch, and hemlock. The wood was cut off nearly a century ago.

Mr. Millett stated that it was best to prepare the ground in the fall, as it assured an opportunity to plant early. As soon as the ground is in a condition not to stick to the seed-sower, the onion seed should be planted. The rows should be run straight, as this will give an opportunity to hoe close, and thereby save a good deal of hand-weeding. When the onion gets up two inches high or more, and the maggots begin to work, he sows three bushels of Liverpool salt to the acre. It should be sown on a moist day. The grape worm is apt to trouble them to some extent, but where the land is highly fertilized it drives the onions beyond their reach. He regards the yellow Danvers as the best variety; sows from the middle of April to the 1st of May, in rows about 14 inches apart. It requires about four pounds of seed to properly sow an acre.

In the course of an article on the survey of Waldo County, Mr. R. W. Ellis made the following statement regarding winter butter-making:

A majority of the farmers in this section think it will not pay, but I have long been convinced that it does not pay to let cows dry up in fall or early winter, and eat up the most, and in many cases, all the profit you get from them in the summer. This winter I have made an experiment to see whether there is an actual profit to be made in making butter in winter, and here is the result; it comes in the hardest part of the year, commencing the 1st of December. I have milked four cows, three Jerseys and one native; had two calves last spring and two last fall. They have had the best of care, kept in a warm stable where the manure has hardly frozen during the winter; their water warmed in the coldest of the weather, and care taken that they should drink twice every day. Their feed has been:

60 pounds of hay per day, at $25 per ton	$90 00
8 quarts corn-meal per day, 80 cents per bushel	24 00
12 pounds shorts per day, 1¼ cents per pound	25 20
Total cost keeping four months	139 20

They have made in the time:

425 pounds butter, ⅝ of which sold at 40 cents per pound	$106 40
The other ⅜ at 35 cents per pound	55 65
Sold $2.75 worth of sour milk per week	49 00
Total receipts	211 05
Less cost	139 20
Net profit	71 85

One of the above cows, a Jersey five-years old last spring, calved one year ago; calves again next September; was kept by Rev. Gilbert Ellis, of Belfast, last summer, and by myself this winter; has made in one year the amount ascertained, by trying her by herself one week in the middle of each month, and averaging the month by it:

April	12	quarts milk	per day,	13	pounds butter	per week	56
May	13	do	do	14	do	do	62
June	14	do	do	13	do	do	56
July	12	do	do	12	do	do	53
August	10	do	do	10	do	do	44
September	9	do	do	10	do	do	43
October	8	do	do	9	do	do	40
November	7	do	do	8	do	do	34
December	7	do	do	8	do	do	35
January	6	do	do	7	do	do	31
February	5	do	do	7	do	do	29
March	5	do	do	7	do	do	31
Total							514

Average quarts per day, 9; total in year, 3,825; average butter per week, little over 9 pounds 14 ounces; average quarts of milk to a pound of butter, 6¼.

384 pounds of the butter sold for 40 cents per pound	$153 60
The other 130 pounds at 35 cents per pound	45 50
Reckon sour milk at 500 gallons, 12 cents per gallon	60 00
Total	250 10
Cost of keeping for two months last spring, 20 pounds hay per day for sixty days	$12 00
2 quarts per day of barley, oats, and corn-meal, each 15 cents per day for sixty days	9 00
For pasturing five months in summer, and an average of 1½ quarts meal per day	11 75
For five months this winter, 15 pounds of hay per day, 1¼ per feed	28 12
3 pounds shorts per day for 150 days, 450	7 88
2 quarts corn-meal per day	7 56
Total	76 31
Income	$250 10
Expense	76 31
Profit	182 79

The autumn meeting of the board was held at Houlton, Aroostook County, on the 1st, 2d, and 3d of October. Nineteen members of the

board were in attendance, besides a large number of leading farmers from the county and more distant sections of the State. The reading of the various essays prepared for the occasion was followed, as usual, by interesting and animated discussions.

In the course of an essay on dairying, Mr. J. W. Lang thus speaks of the many natural advantages which the climate and soil of Maine afford for making the State a great and successful dairying district:

The greater part of the lands of the United States are excluded from dairy farming, on account of situation and natural unfitness. Those lands lying between the fortieth and forty-fifth parallel from the Atlantic to the Mississippi, embrace nearly all that is available. Only one-third of this narrow belt is of highest excellence. This belt embraces New England, New York, Ohio, Wisconsin, Michigan, and a part of Illinois and Indiana. The eastern section is the best, and its excellence for milk production decreases as we proceed west. The requisites of a good milk producing country, are high, undulating surface, abundance of good water, and soil retentive of moisture. This induces the abundant growth of sweet, nutritious herbage, frequent showers, a cool climate, and a healthy, pure air. We have no large uninterrupted stretch of country where dairying can ever develop itself into a specialty, but rather, it must ever be confined to sections in the States before mentioned. Grain productions in these natural dairy regions can never compete with the prairie country, or the broad, natural cereal field of the South, or the rich Pacific slope. Stock raising can never, except for local markets, compete for a moment with the wide ranges beyond the Father of Waters; but this belt must ever rely upon three leading specialties—dairying, fruit culture, and sheep husbandry. Those parts of it not best adapted to milk, are specially adapted to the raising of apples and small fruits, or to mutton and wool raising.

After stating that the rapidly increasing consumption of cheese, with its corresponding increase in price, together with the limited sections that must always be looked to for the chief supply, and a rapidly increasing foreign demand which renders an overproduction utterly impossible, he thus alluded to the cheese-factory system:

Under present circumstances, cheese-factory associations offer the best inducements in which farmers in good grazing sections of Maine can engage. The three pioneer factories already established, and the score of others that started last spring, demonstrate that for five months a cow averages $50, whose milk is manufactured into cheese. Instances are on record where cows have returned $100 for five months. * * * * Milk, as a whole, is poorly understood even by those of us who have never been weaned. When viewed under the microscope, milk appears as a transparent fluid, in which float innumerable small egg-shaped globules. These globules consist of fatty matter enveloped in shells of curd or casein. Take out these globules, and we find remaining in the fluid in solution: first, curd or casein; second, albumen; third, milk sugar; fourth, mineral matter. Good milk is composed of the following per cent. of elements: water, 87.40; butter, 3.43; casein, 3.12; milk sugar, 5.12; mineral matter, .93. It is these substances that render milk heavier than water; two of these elements the dairyman seeks to extract and preserve. These two elements are butter and cheese. The globules of fatty matter, by mechanical action, or by process of heat, burst and yield up their oil—butter—which clusters together under certain conditions, and can be easily taken out of the residue, which we call butter-milk. * * * * When rennet is applied to milk, it causes it to coagulate rapidly and form a curd. In doing this, the rennet, which is an infusion of animal membrane—the stomach of the calf or pig—containing a pungent acid known as gastric juice, dissolves the curd sacks in which the butter is contained, and by its affinity and the attraction the particles of curd have for each other, a mass is formed; in this mass is a large per cent. of the butter of the milk; the residue of the milk, after being curdled, is known as whey, and is drained off; and the curd, after proper manipulations, is put to press to expel what may be left of whey among it. In these processes, a portion of the butter escapes with the whey, and is either lost, or collected and manufactured into what is known as whey-butter, which is often made a very profitable item of income.

After giving some general rules to be observed in dairying, the following directions as to the proper location and plan for a butter and cheese factory are given:

A cheese factory or butter factory should be located at the side of a hill so as to have one story partially below the drive-way where milk is delivered, and so as to have pure water led in pipes to each story, and in a pipe across one side, with faucets at conven-

ient distances, so that water will always be at hand, which will save much expense in conducting the operations. The factory should be situated so as to have pure air, and not near any sluggish water, bog, or other impurity. It is always best to build large enough—double the size at first needed is a safe rule. Thirty to forty by one hundred feet is a proper size, if three stories high, for four to five hundred cows. Even six hundred could be accommodated by such a building, and its cost would be but a few hundred dollars more than one of half the capacity, that would cost as much to enlarge as it did to build in the first place.

Milk can be profitably gathered from five to six miles with teams, and the better way is to have from three to five men do the gathering. They can do it cheaper than for each one to do his own trucking, and can return each patron's whey where they take the milk. The factory need be only boarded and battened with a tight roof, and suitable doors and windows, with tight floors and proper ventilators. No ceiling, lath, or plaster is needed. The presses are simply large screws, working through a solid beam, and having a platform beneath on which the cheese is placed. They are arranged thickly along one side, and occupy but little room. The vats are provided with fire-box beneath for heating the milk, previous to curding. The milk cans should be ten gallons, and be without faucet. One known as the iron-clad can is said to be a very desirable article.

At the conclusion of Mr. Lang's essay, Mr. Daniel Spooner, of East Dover, gave a brief account of the cheese factory established in that town in the spring of 1873. The building is 32 by 60 feet, and cost $1,700—this sum being much less than was at first anticipated. Operations were commenced June 25, and closed August 30, in consequence of the severe drought, which caused the flow of milk to be very small. During this time over 12,000 pounds of cheese were made, most of which was sold in the village of Foxcroft and Dover. The vat cost about $80. The milk of one hundred cows was used, and it would have cost but little more to have run the factory on the milk of from two to three hundred cows. As an evidence of the success of the factory, Mr. Spooner stated that the company made the cheese for one man who furnished the milk of seven cows and two heifers for a period of eight weeks, charging him 2½ cents per pound for manufacturing, and at the end of this time turning over to him 1,020 pounds of cheese, which, at 15 cents per pound, would amount to $153, or, after deducting the cost of making, $127.50.

There are between twenty and thirty cheese and butter factories in the State, all in successful operation.

The secretary, in his closing remarks, states that the year has been one of average returns to the farmer. While some crops were below the average, the yield of hay—a crop of great importance to the people of Maine—was very heavy, and was harvested in good condition. The yield of fruit was hardly an average, that of apples being very light.

The agricultural societies of the State are represented as being in a flourishing condition, and are accomplishing a good work in the advancement of farming interests.

The State College of "Agriculture and the Mechanic Arts," has graduated its second class, and seems to be on the high road to success.

MASSACHUSETTS.

The annual report of the State Board of Agriculture for the commonwealth of Massachusetts, for the years 1872-'73, is contained in a well-printed volume of over 600 pages. The work was prepared and supervised by Mr. Charles L. Flint, secretary of the Board, and contains many valuable articles on topics of current interest to the agricultural community of New England. It is now twenty years since the establishment of the Massachusetts State Board of Agriculture. During that time its operations, suggestions, and advice have been alike honorable and useful to the commonwealth and of invaluable service to the agricultural community.

The secretary complains of the inaccuracy of the statistics of the census report for 1870 as they relate to that State, and shows that the marshals wholly omitted every article of production on more than nine thousand farms within the limits of the commonwealth; hence no deductions of any value as to the condition of its agriculture at present or in 1870, as compared with the years 1850 and 1860, can be made. The census for 1850, for example, states the number of farms at 34,069; that of 1860 at 35,601; while that of 1870 gives only 26,500—a decrease of 9,101 farms since 1860. According to the statistics of industry for 1865, made from official returns of the selectmen for each town, the number at that date was 46,904, indicating as overlooked in the census of 1870 more than 20,000. But the secretary had a still better means of comparison, so far as a few items are concerned. The assessors, in May, 1870, returned the number of cows taxed in the State as 161,185, and in May, 1871, as 162,782, while the census of 1870, taken at the same time, returns only 114,771—a discrepancy of nearly 50,000. Again, the assessors, in 1870, return the number of horses as 107,198, and in 1871 as 112,782, while the census of 1870 returns only 41,039 as on farms and 45,227 as not on farms, making the total number 86,266 and leaving 20,932 overlooked by the marshals.

The plan of operations adopted by the Board in 1864 contemplated annual public meetings in different parts of the State, at which there should be lectures and discussions. This plan has been continued, and the lectures and discussions have generally constituted the leading features of the annual report of the secretary. The last country meeting was held at Barre, on the 3d, 4th, and 5th of December, 1872. At this meeting Mr. Harris Lewis, of Herkimer County, New York, delivered an address on dairy husbandry, some of the propositions of which were objected to and eventually warmly discussed by other speakers present. As to the best food for dairy cows Mr. Lewis said:

I think the food best adapted for the dairy cow is grass—grass first, grass last, and grass all the while. If you will look into the internal arrangements of the cow, you will come to the conclusion that she was made to eat grass, or else grass was made for the cow to eat. Now, the question may sometimes arise in the mind of the dairyman, "How is she to get grass?" Well, that is the question. How can you provide for the cow a sufficient quantity of good, nutritious grass? My notion is that a cow should be turned out to grass as early in the spring as the weather becomes suitable for her to be out, and as soon as the ground becomes sufficiently settled and dry. By turning your cow out early, as soon as the weather and pastures are suitable, she will nip the first grasses that start; and what dairyman is there among you who has not different kinds of grasses growing in his pastures, which, if they are allowed to grow to a considerable height before they are cropped off, will grow up and go to seed, and the cow will never touch them? but if cropped when small, when young and tender, they will be cropped throughout the summer, and your pasture will carry more stock and carry it better; and cows will produce more milk throughout the summer if you turn them in early in the spring than if you keep your stock yarded until the middle of May. Why, gentlemen, I think that the man who will keep his cows confined in his yard or in his stable until the middle of May ought to go to jail. It is advantageous to the cow as well as to the pasture to turn them on the grass early. You turn a cow out as soon as the grass starts in the spring, and then continue to feed her hay as you did through the winter, as long as she will eat it, and roots as long as she desires them, and you make the change so gradual from hay to grass, that the cow hardly realizes it or is in any way affected by it. It is a bad practice to shut a cow up in the barn until she can get a full feeding of fresh and nutritious grass, and take her off in the morning from her hay and change her right on to a pasture. Although not all the ill effects may be discovered at first, in a few months your cow may have an attack of garget, and the cause and effect have been so far removed from each other by intervening time that you fail to trace the connection between them; yet it certainly exists. The milk-producing organs are terribly overtaxed, and the cow feels it when she takes hold afterward. There is less danger, however, in turning a herd of dairy cows into a fresh pasture that have been wintered on grass than a herd that have been wintered on hay. And in speaking of grass and hay here, I desire to convey the idea that a cow ought to be win-

tered on grass as well as summered on grass. Let me explain myself: cut your meadow while it is grass; do not wait until it is changed into that woody fiber we call hay. Cut your meadows while they are grass, and you have dry grass to winter your cows on.

The speaker regards June grass as the best food for dairy cows, but recommends pastures of mixed grasses. While experience has taught him that white clover alone is the poorest of all pastures for dairy purposes, he would not entirely exclude it from mixed pastures. Cows will shrink in their milk when fed on white clover alone, and when transfered to other pastures will at once regain what they have lost. He regards grass as the natural food of the cow, and in his discussion of this point said:

I have fed cows that were out to pasture that had all the grass they could eat, even if they sat up nights to eat; I have fed them all kinds of food, in addition, without being able to increase the quantity or improve the quality of the milk produced. Hence I say that grass is the food for the cow; and I say, in connection with it, that corn is unnatural food for the cow. You may feed any of our grains ground fine—as they always should be, to be fed—to a cow or any animal you are about to slaughter, and you will find that it passes through the first stomach, by the second, through the third, on to the fourth, and part of it even beyond that, within the space of fifteen minutes. That is, you may feed an ox or a cow fifteen minutes before you want to slaughter the animal on fine-ground grain, and you will find it in the fourth stomach or beyond it. There is nothing in the stomach to hold it, and, unless you mix it with other food so as to retain it, it passes off and only a very small portion of it is digested.

As a soiling-plant Mr. Lewis regards lucerne as the best. Cattle eat it with great relish. It will grow more than 100 inches in a year on a good soil that is adapted to its requirements. It wants a deep, loose, mellow soil, and if the soil is open, so that the roots can run down about eight feet to reach water, it will be found the proper dwelling-place for lucerne. Before closing his remarks on the subject of the summer-feeding of dairy cows, the speaker advised the sowing of every kind of grass indigenous to the soil when putting down a piece of land to pasture.

In winter-feeding Mr. Lewis warmly urges the use of mangold-wurzels. By feeding them each day in connection with dried grass he claims that he turns January into June, the best of all the months for tender and nutritious grasses. By this means the cow has her grass restored to its original quality and succulence; the very food nature designed she should have all the year round. He has found no other system which gives as satisfactory results, or which can be performed so cheaply. His mangold crop never cost him over 7 cents and 4 mills per bushel, and he has grown them even as low as 5 cents and 4 mills per bushel.

Mr. Lewis was followed by Dr. Sturtevant, who confined his remarks to the dairy interests of the State. With reference to the average yield of milk per cow in Massachusetts, he alluded to a record of seventy-six different experiments, carried on by nineteen different persons, in Worcester County, during a series of years, by which it appears that it took on the average 20.9 pounds of milk to make a pound of butter. In 1864, the statistics of 425 cheese-factories in the State of New York gave the proportion of milk to the pound of cheese as 9.11. He reckons, therefore, as a fair average, 25 pounds of milk for a pound of butter, and 9½ pounds of milk for a pound of cheese. The census of Massachusetts for 1865 gives the amount of milk sold from each cow as 691 quarts. In nine towns in the Hoosac Valley, with 7,480 cows, the average yield in this year was 1,179 quarts per cow. The average premium dairy of seven cows in Essex County is reported to have given about 1,750 quarts. Another dairy of nine cows, in Danvers, in 1866, is reported to have given about 2,000 quarts per cow. Another gentleman in Sudbury, who fed daily five quarts of a mixture of rye, corn, and cotton-seed meal to

his herd, reports sales of 2,274 quarts per cow for one year. Still another premium herd of six-grade Durhams is reported as having averaged 2,460 quarts per year. The production of four single native cows is given, each averaging 3,189 quarts per year, and forty-four native cows, in four herds, 2,160 quarts per cow. Dr. Sturtevant then states it as probable that the average yield of dairy cows in New York is not far from 1,300 quarts, that of the best dairies in the State about 1,800 quarts, and the best possible average that can be attained, with the best herds, not over 2,300 quarts per year. He then, as follows, briefly gives his own experiments with dairy cows:

In 1865 I and my brother purchased "Waushakun Farm," in Farmingham, Middlesex County, and procured the very best native cows we could find, continually disposing of poor cows and replacing them by better, and breeding in stock. In 1866, with an average of 35.7 cows, we produced 2,160 quarts per cow, on an average. In 1867, with an average of 36.3 cows, the average yield per cow was 2,229 quarts. In 1868, with an average of 27.4 cows, the average yield per cow was 1,850 quarts. The average yield for three years was 2,079 quarts per cow.

We then imported some Ayrshire cows, and these, with other Ayrshires purchased in this country, comprised our herd for the next three years. As we were now breeding, we had to change our system of feed. A system which would allow us to send a cow to the butcher when injured would never answer with a breeding herd of valuable animals. In 1870, average number of cows 19.8; average yield per cow 2,616 quarts. In 1871, average number of cows 18.7; average yield per cow 2,300 quarts. In 1872, probable number of cows 13; probable yield per cow 2,853 quarts. Probable average number of cows for three years 17. Probable average yield of milk per cow 2,588 quarts. I use the word "probable," because the year is not yet ended. It cannot be far from correct, however. The years 1870-'71, it will be remembered, were years of extreme drought, and very unfavorable to pastures.

I will state here that Mr. Miles, of Fitchburgh, who makes a very candid and apparently fair record of his herd of 9.3 cows for three years, gives his average as 2,587 quarts per cow per year. I shall now present the facts I have deduced in another form:

Breeds of cattle.	Possible average.	Average of best dairies.	Common average.
	Quarts.	*Quarts.*	*Quarts.*
Natives	2,300	1,800	1,300
Ayrshires	3,000	2,500	2,000

Here is a difference of 700 quarts in each class; and, if my figures are correct, (and I have taken every fact I could obtain, and excluded none,) this sum, 700 quarts, may well represent the breed difference of the Ayrshire and native cattle. * * * The milk-farmer who is selling his milk at 4 cents a quart can increase his annual yield by at least $28 per cow by replacing natives by Ayrshires of equal grade.

The speaker mentions, as a curious fact, that of all the cows whose yield for a year he can find given in the Massachusetts Report, (he has not the Reports for 1858-'62,) the average of the four premium native cows is 3,189 quarts; the average of the three Ayrshire crosses per year is 4,673 quarts; the extremes among the native cows are 2,692 quarts and 3,826 quarts; among the Ayrshire grades, 3,700 quarts and 6,048 quarts; the average of the best native or grade herd of six cows, selected from a herd of twenty, for one year, was 2,462 quarts; the average of Waushakun herd of Ayrshires, six selected animals, for one year, was 3,123 quarts. Here is still a difference of 700 quarts, representing the breed difference between Ayrshires and natives.

The business of the first day's session of the board was closed by a very able address, delivered by Mr. William S. Clark, on the "Relations of botany to agriculture." On the re-assembling of the board, on the second day, an excellent paper on "Hereditary influence in the

improvement of stock" was read by Dr. Nathan Allen, of Lowell. This was followed by an address from Professor Agassiz, on the same subject, during the delivery of which the professor took occasion to dissent from some of the views recently advanced by Professor Darwin. After explaining what is known as the "Darwinian theory," Professor Agassiz said:

According to these views, a reptile must be the offspring of a fish; according to these views, a bird must be the offspring of a reptile; according to these views, mankind must be the offspring of quadrupeds, as quadrupeds are the offspring of birds. It will be conceded, I suppose, without any question, that the later animals must be the descendants of the earlier ones, if there is a succession of generations. Now, geology and paleontology, (that is, the knowledge we have of the animals which have existed in former times, and have followed one another,) show us that the classes of higher animals, not to take in the whole animal kingdom, have followed one another after this order: That fish existed before reptiles, reptiles before birds, birds before the mammalia or quadrupeds, and that these existed before man. Now, if we are descended from monkeys, quadrupeds must be descended from birds, birds must be descended from reptiles, reptiles must be descended from fish. Have we such information? No; and when I do not admit that animals are thus descended from one another, it is because I do not know how they originated any more than Darwin does. It is a theory, perhaps. I do not believe it is as much as theory. I believe it is a brilliant expression of his magnificent imagination. And I will not disparage that faculty, for there is no science without imagination. Imagination is that powerful faculty with which we conceive of relations which are beyond the reach of our perception, through the senses, and without imagination there is no progress in science; but it is in proportion as imagination is constantly controlled by experiment, by experience, by observation. Now, I know Darwin personally, and he knows himself, too; and early in his life, in his admirable narrative of his journey with Captain Fitzroy around the world, in which he has disclosed so largely and so brilliantly that power of observation which is so eminently his characteristic, he closes that narrative with something like these words, which I cannot probably quite quote *verbatim*, but the sense I know too well to misquote him: "That nothing is more profitable to a naturalist than traveling, on account of the varied impressions and the varied opportunities afforded for observation; but the danger is in proportion to the opportunity. Seeing so many things in rapid succession leads to hasty conclusions, and passing from one hasty conclusion to another hasty conclusion, the result may be an entirely wrong view of the phenomena observed." The man who said that of himself at the close of his first really great scientific survey has furnished in his own life the evidence of his own propensity. It is hasty generalization on some well-observed facts; and that is Darwin all over. I do not think that I have expressed anything disparaging of his ability or of his character, but I am satisfied that I estimate justly his tendencies, and that we find him constantly making generalizations for which there is hardly a shadow of a fact, the natural consequence of which is, in my opinion, that the idea of natural selection is entirely out of the question. But while I do not believe in this theory of the descent of all organized beings from a few primordial ancestors, (and I will tell you why I do not believe at all in the idea of "natural selection" and of the "survival of the fittest,") it seems so very natural, it is Malthus all over, and it is so desirable, that it seemed to a practical Englishman almost a natural necessity. But let us see how it is. Do we find that only the strong beget families? Do we find that the children of apparently weak parents are always weaker than their parents? or that they are unfit to survive? I do not think that human experience goes that way. I do not think that in nature, under the broadest possible field of observation, we see anything like it. Let us observe, for instance, such plants as have a wide distribution. We see, for instance, that our pine-trees at the foot of the White Mountains are stately, large trees. At a certain height upon the slope of the hill they are smaller; near the summit they are stunted shrubbery; and yet that stunted shrubbery has been in existence near the top of the mountains ever since pines have been growing on the sides of the White Mountains, and they have propagated and multiplied in that condition just as well as the stately trees in the valley. It is a stunted, creeping sort of an existence, but they have survived, and have had as long an existence as the strongest and largest in the lower part of the country. It is, therefore, sometimes a law of nature that the weakest and apparently least fit are those that survive. Nature tells us in that case—and the cases might be multiplied—that there is some reason why the weak may survive as well as the strong; some reason why those who to us appear less fitted have as good a hold on life as those which appear to us more fitted. Why that should be we do not know, and it is probably because of our ignorance in this matter that there are those who deem that "natural selection" is the law of nature, and others who do not believe that the theory of "natural selection" has any value at all.

At the close of Professor Agassiz's remarks, Mr. Flint, secretary to the board, being called upon by the chairman, spoke briefly on the subject under consideration—that of hereditary influence in the improvement of stock. He said that every farmer, in attempting to breed for the improvement of his stock, ought to bear in mind that the hereditary power of the animal—that is, the power of transmitting its qualities to its offspring—is constantly cumulative; that is, if the animal has been properly bred. For example, the general law that like produces like is undoubtedly correct upon general principles; the difficulty is in a want of knowledge as to the qualities and characteristics of the two animals which are brought together. They may appear to the eye to be alike, and yet there may be essential differences. If they are alike in all their essential peculiarities, the offspring will not only be like the parents, but will have their characteristics much more strongly marked; that is, the essential characteristics in which the parents are alike will be intensified in the offspring, and therefore the hereditary power of the offspring—that is, the power of transmitting its peculiar qualities—will become stronger and stronger. But if, on the other hand, the parents are not alike, if there are any essential differences between the male and female, instead of this power becoming stronger and stronger with every successive generation, it will become weaker, it will become broken and very greatly reduced, so that it cannot be depended upon at all. Farmers are frequently heard to say that they care nothing about pedigrees—they desire to see the animal, and then they can tell whether they want to breed from him or not. There can be no greater mistake than that, for the reason that this hereditary power, this power of transmitting the peculiar qualities desired in the offspring, is latent; is hidden in the system. It cannot be detected by the eye; it cannot be detected by any known law, except that of hereditary influence—pedigree in other words. As to still another difficulty, Mr. Flint says:

We cannot tell whether the pedigree of these two animals—the parents—is perfectly satisfactory or not. It may be as long as the moral law, and yet there may be breaks in it which have constantly reduced and weakened that hereditary power. If we knew positively the peculiar characteristics of all the ancestors of all the animals that we are to breed from, then we could tell with some degree of certainty what the result would be; but the mere fact of a recorded pedigree is not worth anything unless we know the character of that ancestry—unless we know that in each case the male and female in each successive generation have been alike and of good quality. To illustrate more clearly: We might suppose that a certain male, after a certain number of generations, has the hereditary power strongly concentrated in his system. If he is the offspring of parents, grandparents, and great-grandparents which have been alike in both cases, he has the hereditary power—that is, the power of transmitting his qualities—very strongly marked and intensified in his system; more strongly than it was in his parents, grandparents, or great-grandparents. Now, suppose the power which this male animal has of transmitting his essential qualities to his offspring could be represented to the naked eye. Suppose, for instance, we call his hereditary power equal to 100. Now, suppose the female to which he is put has been bred differently; suppose she has been cross-bred, just as the common stock of the country, or what we call native sheep, have been bred, without any system, without any care to couple animals which are absolutely and essentially alike; of course the hereditary power of that female will be very much less than the hereditary power of the male, because the hereditary line—the power of transmitting qualities—has been broken, and has been greatly reduced. We will suppose, for instance, that her power of hereditary transmission—her power of transmitting her qualities, her peculiar characteristics, to her offspring—is only 60 instead of 100. Now, these two animals are coupled together. What is the offspring? The offspring will possess a hereditary power not like its male parent; it will possess a hereditary power—that is, a power of transmitting its characteristics to its offspring—not represented by the 100, not represented by the 60, the value of the hereditary power of its mother, but by a number perhaps somewhere intermediate between them; it would be difficult to tell exactly what. I do not mean to say that there is any law which will represent it exactly. I merely give this as an illustration to show you how greatly the hereditary power is

constantly reduced when the parents are not alike. I say in such a case as that you could represent the hereditary power of the offspring of such parents not by 100—the hereditary power of its father—nor by 60—the hereditary power of its mother—but it would be a power very greatly reduced. * * * Now, I say the farmers should bear in mind that this hereditary power, which is so valuable and important, and on which our whole improvement must depend, is hidden, latent, cannot be detected by the eye. That shows the value of a good pedigree; but not merely a recorded, written pedigree. It must be a full pedigree, such as to guarantee the quality of the ancestry. The pedigree ought to be studied in each case, and in that way, and in that way alone, can we breed with any degree of system, or any degree of certainty in regard to the result.

During the session an address was delivered by Mr. Farwell F. Fay upon "Practical questions of law relating to farm property." A brief address was also delivered by Professor D. D. Slade on the subject of the Prevalence and treatment of the catarrhal epidemic among horses. An essay was read by Mr. Andrew H. Ward on the subject of "Manures and fertilizers," and one by Professor Stockbridge, of the State Agricultural College, on the "Management and care of mowing and pasture lands." The lecture of Professor Stockbridge contains much valuable information and many suggestions, which, if heeded, may prove of immense advantage to the farmers of New England. Alluding to the State reports, and referring to what the State board of agriculture has said relative to the treatment of hay and pasture-lands and to the value of the hay-crop, the lecturer says:

I find we have said to each other and to the world that the hay-crop is the most valuable of any single crop cultivated in the United States; that the hay and grass crop combined is worth in the aggregate, in the United States, somewhere between five and six hundred millions of dollars. This is its money-value. And, more than all that, we have said to the farmers of the country that its value in dollars and cents is as nothing compared with its indirect value, in the influence it has in preserving the fertility of our farms, as being the great source of manurial supply. We have said that no farm can be kept up to a high state of fertility, no farm can do otherwise than depreciate, if in its ordinary management we sell the hay produced upon it; and that no man can thrive on a farm, no man can grow rich, no man's farm is supporting itself or him, where the grass-crop is depreciating. We have said, again, that, so great is the value of the hay-crop of the country, we can afford to select our choicest, our sweetest, our most fertile soils for the production of grass and of hay. We have frequently attempted to describe the character of the soil best adapted to the production of grass, and here I must say the board of agriculture are somewhat at loggerheads. One says a good grass-soil is a good corn-soil; another says a good grass-soil is a cold and wet or moist soil. This is the only point about which we disagree; but we are all agreed in saying that the best soils, the most fertile soils, we can afford to devote to the production of this crop. And again, following the record, I find we have said this: that we can afford not only to take our best soils, but we can afford to bring those best soils up to the very highest point of fertility, and keep them in grass, keep them rich, keep them fertile, for the express purpose of producing hay. * * * * We have said, again, that there is such a thing as being too avaricious in regard to the crops which grow upon our mowing-fields; that there is such a thing as mowing our lands too close. And we reason in this way: that there is a mutual relation existing between the roots and leaves of the plants; they grow in conjunction; the roots have their office to perform, the leaves have theirs; and when you denude a plant of its leaves you have stopped their root-action; you have given it a check and injury from which it must suffer until new leaves are developed to carry on the functions of the plant. * * * * We have said, again, that it is bad policy to mow our lands late in the season. While we think rowen is a good crop, and it is well to have it in our barns; while we do not object to the cutting of a second crop; yet under no circumstances should this second crop be cut late in the season, but it should be cut so early that there will be time for another crop to grow to act as a covering for the plant, a sort of protection for it through the winter.

Now, in regard to our pasture-lands. The board of agriculture have agreed unanimously to this: that there has been a great deterioration in the producing-power of our pastures during the last fifty or one hundred years; that the time was when the hill-sides of Massachusetts—those fields that are now our pasture-lands—yielded large quantities of sweet, nutritious grasses—grasses which made butter, which made milk, which made cheese—grasses which made beef of splendid quality. But, gentlemen, you may rest assured that the board of agriculture are right when they tell you that

you cannot make either good milk, good butter, good beef, or good cheese out of these brambles and briars that are so frequently found on our pastures, and that the richness and value of these lands depend very largely upon the fact that they produce fine sweet, nutritious grasses, as they did in those early days, in large quantities; but they have gradually deteriorated. And to this opinion we give our unanimous consent.

Another thing. We have all agreed on saying that the cause of this deterioration is perfectly clear and apparent; that it is because we have been building up animal structures or manufacturing cattle-products which have been taken away from the fields that produced them, never to return; that where all the products have not been transported to the market, we have taken the milk for the manufacture of butter and cheese, and the manurial qualities that were contained in the milk left at home have been given to other fields, instead of being carried back to the pastures that produced them; and that we have been sending away tens of hundreds of tons annually from these New England pastures in the form of phosphates and sulphates in the bones of animals, and nitrogen in their muscles and tissues.

Again, gentlemen, we have said to the world that from one-fourth to one-third of all these pasture-lands should never have been deprived of their original forest-covering, and this I believe is gospel truth. The Lord never designed these steep hill-sides, these mountain-tops for pastures; never designed them for cultivation; the topography of the country forbids. We cannot keep the soil in its place in pasture or cultivation. It was designed, and it is best that this portion of our pasture-lands, our mountain-tops and steep hill-sides and declivities should be allowed—to use that expression—to go back again to forests; and I would say should not only be allowed, but should be assisted by systematic effort, to go back again to forest. The effect of this growth of forests would be, first, to act as a shelter to our cultivated fields, to make our climate more equable, and to give us a more equal distribution of rain instead of having alternate seasons of floods and droughts.

Alluding to the treatment of grass-lands, the lecturer said:

I do not want to be heretical, but I desire to express a few thoughts in relation to the treatment of our grass-lands. The board of agriculture have said: "Never plow the fields that you intend for permanent mowing. Once seeded down, let them remain seeded forever." In relation to that I beg leave to differ, and I will give you my reasons. Let us have as many minds at work upon this subject as possible. Perhaps we are mistaken. I do not believe that the board of agriculture or any one of us know it all. I think we have a great deal to learn, but I think there are some things we do know. Now, in relation to the plowing of grass-lands: Do you believe there is anything in tillage? Does it do the soil any good to plow it, to pulverize it, to break it up and expose it to the air? Does it help your fields, upon which you grow corn, to plow them, to pulverize them, to till them thoroughly? If it does, why will it not help your grass-field to treat its soil thus, especially if that grass-field shall have for its soil a clay? Will it not do that soil good to let the air into it, to warm it, and set the chemical forces at work to develop the plant-food it contains? If there is any truth in the theory of the value of fertilization and tillage, can we not apply it to the grass-crop, and thus reap the advantage? * * * Now, if there is anything in the principles of tillage and cultivation, if it does the soil good to pulverize it, then these fields ought to be plowed occasionally, especially those which have clay in them. The constant tramping upon these fields to gather the hay and the attraction of gravitation and cohesion greatly solidify them, especially clay soil, and they become hard, and, notwithstanding your top-dressing, by and by your hay-field actually begins to fail, and on goes a quantity of manure, because you dislike to plow it up. Now, my experience and observation are that there is no grass-land in Massachusetts but what ought to be plowed once in ten years, sometimes as often as once in five years. This depends upon the condition of the soil.

I know this is heresy, but I am going to give my reasons, and then you may have your chance at me. I will tell you what the trouble, in my judgment, is: When we turn over our hay-fields and reseed them with two kinds of grass—herd's-grass and clover, and perhaps a little red-top—it takes a long time to get them back into a fine condition. I have tried it, and I found that apparently I had met with a great loss by plowing; but when I seeded with a variety of seeds, when I put in herd's-grass and clover, and red-top, and white clover; when I put in orchard-grass and Kentucky blue-grass, and a large variety of grasses, in two years I had a covering as close as I had before, and the crop went right along upon the land, increasing every year. The reason why, apparently, it did not benefit my land to plow it and pulverize it and work it all to pieces was, that I did not do right when I seeded down with simply two kinds of grass—herd's-grass and clover; but I got a quarter more grass upon the land in ten years by plowing twice and reseeding without top-dressing, than I got with the best top-dressing without plowing. Therefore I say, according to my observation, and I think I have very good reason for it, that our grass-lands should be occasionally plowed up, pulverized, and thoroughly tilled and reseeded.

Professor Stockbridge was followed by Mr. Allis, who spoke at some length of the great advantages to be derived from underdraining. To show to what extent lands may be improved, and what results may be derived from draining and good cultivation, he detailed the following experiment:

I came in possession of a four-acre piece of pasturage in front of my house some ten years ago, worth from five to twenty dollars per acre, the preponderating product being a wet, poor-quality of pasture, interspersed with a generous supply of bog-brake, knolls, and some bowlders. In the fall of 1862 I commenced labor upon it by getting out the rocks, laying one hundred and twenty rods of underdrain, broke it up, employing the third man to follow the plow with a hook to turn over what sods and brake-knolls the plow did not. In the spring of 1863 I harrowed well the turf, planted corn, putting a little phosphate in the hill, cultivating with a purpose mainly to subdue the land, and harvested 20 bushels of corn per acre. In 1864 the market-value of manure applied, delivered on the land, was $400. I bought a part of it; phosphate put into the hill, $50; about the first two weeks in June it was set with tobacco; fitting ground, cultivating, harvesting, and preparing for market, cost $350; total expenses of crop $800; I received for the crop $1,800. In 1865 I applied $450 worth of manure and $50 worth of phosphate; stocked with tobacco; cultivating and fitting for market $350; total expense $850; I received for crop $2,240. After harvesting the second crop I raked together the break-heads, which, notwithstanding having been cuffed to skeletons, amounted to cart-loads, and burned them. In the spring of 1866 I sowed with oats and seeded down with one-half bushel of timothy and five pounds of clover-seed per acre; harvested 270 bushels of oats; I have mowed two crops of grass yearly since, with the exception of one dry season, and consider the land worth at least $100 per acre in its rural locality.

In the course of the annual report of the committee on contagious diseases among cattle, made to the legislature in conformity with a law of the State, the commissioners congratulate the people of the commonwealth on the fact that while in some portions of the country and abroad disease has caused most fearful ravages, yet in the State of Massachusetts during the past year cattle have been almost entirely exempt from prevailing sickness, and no contagious disease has visited them.

The annual meeting of the State board was held in Boston on the 3d, 4th, 5th, and 6th of February, 1873, and was attended by the following-named members of the board, viz: Messrs. Agassiz, Allis, Baker, Brown, Clark, Fearing, Hadwen, Hubbard, Hyde, Knowlton, Ladd, Loring, Miles, Moore, Root, Saltonstall, Slade, Stone, Stockbridge, Sturtevant, Washburn, and Wilder. His excellency Governor Washburn presided.

A large amount of important business was transacted at this meeting of the board. The third annual report of the State entomologist, Mr. A. S. Packard, on the injurious and beneficial effects of insects, was presented by Dr. Loring. This essay is copiously illustrated, as is also an exhaustive paper read by Professor Agassiz on the "Structure and growth of domesticated animals." "The use of steam on the farm," an essay read by Professor Stockbridge, and one on the "Relative value of farming among the occupations of life," by Mr. Hubbard, contain much valuable information on the subjects discussed.

An appendix contains reports from about thirty county and district agricultural associations, which shows these societies to be generally in a very flourishing and prosperous condition. The addresses delivered at the opening of the annual exhibitions of many of these associations, beside reports of committees on premium crops, &c., are also given in this appendix.

MICHIGAN.

Pomological.—The second annual report of the Michigan State Pomological Society shows the continued and growing prosperity of the asso-

ciation. The membership of the year was 507. Meetings for discussion of subjects pertinent to fruit-culture were held with regularity, and public exhibitions of fruits had increased in number and intrinsic excellence. The large, well-printed, and handsomely-illustrated volume before us is a fair indication of the energy and earnest work of the young society. A wide field for the operations of such an organization is afforded by the almost unsurpassed fruit-belt of a fair portion of the Michigan peninsula. Says an observing member of the society, in an essay on the history of the peach, at Saint Joseph:

To the inhabitants of the Northwest no greater evidence of design to provide it with a great fruit-land could be given than this peninsula inserted between lakes Michigan, Huron, and Erie; in that conformation of the Pacific slope by which the prevailing winds, sweeping down the vast sierras of the Rocky Mountains, become softened by the mighty plains and prairies of the West; thence blowing from the southwest, west, and northwest, over the deep waters of Lake Michigan, which never freeze, become so mild that nearly every variety of the apple, the peach, pear, cherry, plum, and berry can be grown in as great abundance and perfection as in any part of the world.

The writer refers to the foregoing statement as embracing facts not widely known, and not yet absolutely reduced to a self-evident proposition in the fruit-belt, which some claim extends only a few miles back from the waters of the lake, and that in the immediate neighborhood of river outlets, the location of future cities; some, along the whole peninsula, as far as the snow line; and others into the interior, for miles by the score.

In those districts where adaption to fruit-growing has been clearly ascertained the rapidity of settlement is surprising. The first peach-orchard in Benton, Berrien County, was set out in 1836. It was, then, an unbroken forest by the square mile, but now comparatively one unbroken orchard; and by the last census the township rated as the sixth township in the State according to the value of its farm productions—the State itself ranking twelfth in this respect in the United States. This growth in population and wealth is mainly due to its peach-crop and general fruit-crop, although it is the only township in Michigan that raised over 100,000 bushels of wheat.

In summarizing the present condition of pomology in the State, R. F. Johnstone, secretary of the State Agricultural Society, refers to the orchard-fruits and to the berries which are cultivated for profit with more or less success. There is yet no defined system in regard to the best methods of treating apple-orchards; no successful effort has been made to originate any new varieties from seedlings or by hybridization that would take precedence of those now regarded as the best for profitable culture. For new and old varieties dependence has been placed upon other States. Orchard-culture of the pear is limited, and it is doubted if the culture is well understood, or has been sufficiently experimented upon, or vigorously inquired into. The cultivation of the peach is confined for the most part to the shores of Lake Michigan, and as far inland as the influence of this body of water is supposed to extend. This fruit has not thus far sustained damage, to any appreciable extent, from diseases which have prevailed in other regions where the peach is raised. The varieties grown are those which have been introduced and found to be adapted to climate and soils. No variety has been originated that would supersede the sorts acclimated. As an orchard-fruit the plum is not largely grown, the ravages of its great enemy, the curculio, having discouraged effort in that direction. Little attention has been paid to the cherry. The cultivation for market purposes of the currant, strawberry, raspberry, and blackberry is attracting more attention than

formerly; the varieties now grown are not of Michigan origin. Several varieties of grapes have been raised with success, marketable for purposes of the table. The vineyards for wine-making are mostly confined to Monroe County, lying on Lake Erie—a district found to be adapted to grow the grape to great perfection for wine; but grapes for table-use and for wine-making are cultivated successfully in the "fruit-belt," strictly so called, and vineyards are growing in importance and number. Mr. Johnstone says that thus far there is nothing especially peculiar to grape-culture in the State, for the reason that dependence has been placed on other States for varieties and full confidence given to acclimation. The fig grows and ripens to considerable perfection along the shores of Lake Michigan, but requires protection in winter. However, Mr. Bidwell, of South Haven, on Lake Michigan, whose opinion will be given further on in this notice, does not agree with Mr. Johnstone as to the invariable necessity in that climate of close winter protection. The cranberry and the whortleberry are indigenous, and gathered and marketed largely. No attempt, however, has been made to improve either by culture or otherwise.

The prices of fruit-lands along Lake Michigan are rapidly increasing. At Spring Lake, Grand Haven, and Fruitport land that a few years ago was worth $10 an acre is now selling rapidly at from $50 to $100 an acre, and even higher. South Haven, a few years ago a wilderness, is selling fruit-land at about the same figures; while at Benton Harbor improved lands, with bearing orchards, command $1,000 an acre. Mr. A. T. Pierce, speaking of the South Haven fruit-lands, says there is an abundance of unoccupied or wild lands, the county being yet new, which may be bought at from $15 to $30 per acre, and that there are farms offered for sale which the owners, through force of circumstances, are obliged to dispose of. There are many low, uninviting places, tangled woodland and marsh, which are being subdued and regenerated for fruit-cultivation, and some of these become the paradise of all the berries, the pear, the quince, and the plum, and are also fitted for some varieties of apples, grapes, and even of peaches.

As showing the profits of orchard-lands, the history of the Cincinnati orchard, the largest in the State, may be referred to. It is near Benton Harbor. The orchard was planted in 1857 on land leased from its owner for twelve years at a mere nominal figure. After securing two or three heavy crops, the lease, three years before its expiration, was sold for $12,000. In the year of purchase the new lessees sold the fruit of the place for $15,000 net, and in each of the two succeeding years realized about the same amount. In 1871 this orchard bore heavily, notwithstanding the fact that over 37,000 baskets of fruit had been sold from it the year preceding, netting about $20,000. Originally there were about 65 acres in bearing. In 1872 it was divided into lots, one of which, containing 24 acres, was sold for $23,000 cash. The gentleman who makes these statements asserts that he gives "the facts concerning this property to illustrate what is being done by fruit-growers in a smaller way." The same authority, confining himself to Benton Harbor, says that as early as 1865 there were on both sides of the river no less than 207,639 peach-trees, 40,957 pear-trees, nearly 70,000 apple-trees, about 10,000 cherry-trees, 2,500 quince-trees, 3,000 plum-trees, 35,000 grape-vines, and more strawberry, blackberry, and raspberry plants than could well be enumerated; and that at the present time (1872) it is safe to estimate an increase of these figures by at least 50 per cent. The total shipments of packages of peaches has been as high in value as $700,000, in 1870, of which nearly two-thirds were sent from the docks of Benton Harbor.

The peach-orchard of A. S. Dyckman, in Van Buren County, contains 40 acres, and was planted in 1862. In 1864 Mr. D. shipped 600 baskets. In 1871 his crop was 7,000 baskets; cost of cultivation, including his own time, $1,000; net receipts, above outlays and cultivation, $2,000. In 1872 his aggregate was 12,000 baskets, netting over 50 cents per basket. Since he entered upon the business he has had only one failure, and that was on account of the ravages of the curculio. However, since adopting the Ransom process of exterminating the pest he has been apprehensive of no danger from them. This process, as described by Mr. Ransom himself, who gives his discovery freely to the public, is as follows:

> First, remove everything from beneath the tree, and make the earth as smooth as it can be made; on this depends largely the success of the trap. This being done, take pieces of bark as large as your hand, or a little larger, and place them against the trunk of the tree. Examine your traps every morning, and catch and kill those you find concealed beneath the bark.

Mr. Dyckman places pieces of hemlock-bark about the roots of the tree, concave side down, and as early as the curculio presents itself. The insects may thus be destroyed at one-fourth the cost of shaking the trees.

Too much fruit cannot be raised. It does not seem possible to over stock the markets, the demand increasing with the supply; and the increasing facilities of transportation and new processes of preparing fruits for shipment, without serious detriment to their qualities, making it possible to send the products of the orchard, the vineyard, and the garden long distances with safety and cheapness to regions where these products do not flourish. Canning fruits and vegetables is a business of growing importance in Michigan. In the season of 1871-'72 two establishments alone at Benton Harbor shipped 534,000 cans of fruits and of vegetables of the finer sort. In that season the gross shipments of fruit from Saint Joseph and Benton Harbor by lake and railroad were—27,779 bushels strawberries, 776,308 packages peaches, 51,235 packages of other kinds of fruit, and 16,499 barrels of apples. From stations north of Benton Harbor to Grand Junction it is estimated that over 40,000 baskets of peaches were shipped, and from stations south of Saint Joseph to Michigan City 25,000 to 30,000 baskets.

The recently-invented Alden process of preserving fruits and vegetables is undergoing a fair trial in the State. It is described as a method of removing water from vegetable substances in a few hours by pneumatic evaporation; and it is claimed that by this operation articles treated are made proof against decay, and their palatable and nutritious qualities rather heightened than lessened. As yet the process is a monopoly in the hands of a company. Concerning this process, Mr. D. R. Waters, in an address before the society, regretted that its working is as yet a private interest, designed for the benefit of the few, but felt certain that in time it would become the common property of every producer of fruit, and that the advantages it confers are as secure to the fruit-grower of the near future as is the enjoyment of its profits to the inventor at this time. He says:

> The man who plants orchards next year and lives to see them mature will be enabled by this process, untrammeled by letters-patent, to prepare his crops in such a shape that they can be marketed to the distant parts of the world with as much ease, with as little cost, with as much security, and probably greater profits, as are now marketed the citron of Italy, the grapes of Spain, or the currants of the Lavant The fruit-grower will soon not only repose beneath his own vine and peach-tree, but will also rejoice in the possession of his own pneumatic-tube and dehydrating-apparatus.

Mr. Bidwell, of South Haven, has been successful in cultivating figs for several years. They stand without protection during the winter, and

bear two crops a year. Clean culture is all that is required. Some facts concerning the open-air culture of figs, and hints as to modes of conducting it, are given by Mr. Bidwell, as follows:

On warm, dry, rich, sandy soils here the fig grows with as much freedom as in the Gulf States, and on account of our exemption from late spring frosts, the first crop is more certain than in Georgia or Tennessee. One is astonished to see their luxuriant foliage, which is remarkably free from curled or yellow leaves, a fact doubtless due to the uniformity of heat, light, and moisture of our climate. One peculiarity of the fig is that its fruit-buds start simultaneously with the leaf-buds, which can be readily distinguished the fall previous. The buds begin growth here the forepart of May, and by the middle of June the new shoots are about one foot in length, and the young figs the size of hickory-nuts. Then they commence swelling very rapidly, and in a few days are the size of small green pears; in two or three days more, or about the 1st of July, they become yellow, when they are ripe and ready for picking. In some countries they are used as daily food, eaten in milk, and are very wholesome and nutritious. They can be canned or dried, but are too good for that purpose until more abundant. The second crop begins to grow as soon as the first is removed, and usually gets ripe the forepart of September. It is not always necessary to give them protection in the winter, but for the purpose of dividing them, and to guard against extreme winters, it is advisable to heel them in, which can be done at any time after the frosts of autumn remove the leaves, before severe winter approaches. The process is very simple; dig one plant and lay it on its side in the hole, then dig the next, throwing the dirt on the first, and so on until they are all covered. Reverse the process in the spring, at which time you can divide and prune into shape, using the cuttings for new plants, which strike root readily, and often bear fruit the first season. In setting out the plants, give them room according to their size. Taking them up or dividing them does not prevent them from fruiting if the roots are not badly bruised nor dried by exposure to the weather. Where one has but few plants, open boxes or barrels can be set over them, filling in with straw or dirt. The simple process of protecting the plants in winter should not deter any from growing and enjoying such delicious fruit.

The variety grown by Mr. Bidwell is the White Marseilles, or fig of commerce.

MINNESOTA.

Horticultural.—In compliance with an act of the legislature, a history of the Minnesota Horticultural Society has been compiled and published in a well-printed and neatly-bound volume of 200 pages. The work contains a history of the association from its organization at Rochester in 1866 to the last meeting held in Saint Paul in 1873, with the addresses delivered and abstracts of the debates which occurred at the various meetings of the society.

In the introductory remarks of the committee who had charge of compiling the history of the society due credit is given to the pioneers of fruit-culture in the State, whose efforts, after many serious reverses and frequent failures, have at last been crowned with abundant success. While the climate and soil have demanded constant experiments looking to new and hardy varieties of fruits, to be had only by patient and persistent trials, the history from year to year of this important enterprise shows that the State has, from the first, been favored with a few determined and enterprising men who have never wearied in their self-imposed task—men who, keeping but one important end in view, could not think of failure as possible. The result is, after many years of patient experiment, the announcement of a list of fruits reasonably certain as to their production and of excellence unsurpassed. The committee say:

No one can go over the debates held at the meetings of these pioneers in fruit-culture and not be struck with the constantly-recurring announcements in their early history of losses in trees, oftentimes on the most extensive scale, too; losses borne apparently of course, and with a philosophy commendable in the highest degree. Sometimes seeing their trees suffer because of too tender varieties; sometimes from blight; killed one year at the root, the next, perhaps, at the top; sometimes because of a too-late-

ascertained wrong exposure or situation, and so on; and yet all this, we repeat, borne with a patience wonderful to relate now. The result has been that out of all these losses, these mistakes and disappointments and numberless experiments, at last a degree of certainty in fruit-culture has been attained, such as must finally place these men on record as benefactors of the State, and the State itself in the front rank as one of the fruit-growing States of the great Northwest. * * * *

Let it be noted, further, and preliminary to a careful survey of the proceedings at large of the horticultural society, that a long period of experiences has shown conclusively that, however gradually, yet none the less surely, the leading fruit-growers of the State have been approximating firmer ground in establishing their success upon a sure basis. From the first exhibition of fruits at Fort Snelling, at the fair of 1860, when premiums were awarded for a few crab-apples and for grapes and strawberries principally, and from the next regular display publicly of apples from grafted trees by that veteran pioneer in fruit-culture, John S. Harris, of La Crescent, when he produced no less than nineteen varieties—a most creditable display at that time (1866)—down to the last meeting at Saint Paul, when a variety so rich and attractive covered the tables as really seemed to leave nothing to desire, the advance, all must acknowledge, has been unparalleled.

Among the early fruit-growers of the State, the following-named gentlemen are given honorable mention: Eli Robinson, John Shaw, P. M. Nichols, H. F. Masterson, Dr. L. H. Garrard, Henry Orstine, Theodore Fuber, Truman N. Smith, Dr. Ames, Dr. C. W. Borup, A. D. Foster, Dr. Jarvis, Mrs. H. L. Moss, Rudolph Knopheide, Dr. S. H. Chute, and Messrs. Simons, Selby, Bell, Buchanan, Nourse, Marshall, Steele, Dana, Livingston, Bohrer, Martin, Oakes, Barton, Pond, Gideon, Stevens, Robertson, and a few others.

Mr. Peter M. Gideon, in giving an account of his experiments in fruit-culture, says that he commenced operations nineteen years ago, by planting 350 apple-trees and about 50 pear, cherry, quince, and English plum trees. Of the lot only one cherry and part of one apple tree remains. At the same time he planted one bushel of apple-tree seeds, one peck of peach and a few grape seeds. The net result of the planting of all these seeds was one apple-tree, which produced a few apples during the two last seasons, of very inferior quality. Of the first eight or ten thousand trees set in orchard he has not forty remaining; and of the first twelve years' planting of apple-seeds, all grown further south, not thirty remain. Since that time he has been planting seeds from apples of his own growing of the hardier sorts, and the result, as to the stand of trees, is very satisfactory, but not entirely so in regard to fruit, which mostly proves to be crab, whether grown from crab or apple seeds. He has grown perfect crab-trees from apple-seeds, and perfect apple-trees from crab-seeds; but let the trees be what they may in appearance, a crab is the fruit in nearly every instance. He has several seedling-trees which produce fair fruit, but the only one he regards as worthy of extensive cultivation is the Wealthy apple, grown from seeds sent to him by Mr. Albert Emerson, of Bangor, Me., about twelve years ago. He describes this as a perfect apple in all respects except its outside lustrous finish, which is crab. From its seeds are grown as many perfect crab as apple-trees. In size the Wealthy apple is large, form nearly round, color yellow ground, in some samples nearly covered with bright red, a lighter red sometimes extending quite deep into the flesh, which is white, tender, juicy, quite melting and refreshing; core rather small, compact; seeds plump, dark-brown; stem, medium and hard; season, early winter; quality, best.

From 1852 up to 1866, nearly fifteen years, there appears to have been no regularly-concerted action between the fruit-growers of the State, but each seems to have pursued his own solitary way in seeking to find out the best method to establish fruit-culture on a certain basis. The most that was attempted in the way of comparing experiences and endeavoring to stimulate efforts appears to have been done by the Saint Paul

Farmer and Gardener, the first number of which was issued in November, 1860. An occasional paragraph appeared in other papers of the State, briefly chronicling partial successes here and there among those leading the advance in fruit-culture.

The first evidence of a growing interest on the subject of fruit-culture was shown in establishing a class for the exhibition of horticultural articles at the State fair held at Fort Snelling in 1860. But, as already stated, there was only a meager display at this exhibition: a few pears, crab-apples, and grapes being the leading fruits shown. At the meeting of the State Agricultural Society held at Saint Paul in February in 1862 a committee was appointed on horticultural matters, with instructions to collect facts and statistics on the subject, and report the same to the next annual meeting. At a meeting of the executive committee of this society, held at the fair grounds in Minneapolis during the month of September, 1866, the first premium for essays on fruit-culture was awarded to Mr. D. A. Robertson. This gentleman was among the first to introduce fruit-culture in the State, and by his energy, perseverance, and ultimate success had succeeded in awakening a general interest throughout the State on the subject of horticulture.

The rapidity with which hardy varieties of apples have been produced by the fruit-growers of this State and some of the more tender sorts acclimated is somewhat remarkable in the history of fruit-culture in this country. Up to the year 1860 but little interest was either shown or felt in the subject of pomology, as the climate was regarded as too severe to grow trees or produce fruit with any certainty. But six years later (1866) Mr. J. S. Harris, of La Crescent, is highly complimented for exhibiting at the State fair fine specimens of the following-named varieties of apples of his own raising: Fall Pippin, Juneating Red Streak, Westfield Seek-no-further, Tolman Sweet, Western Seek-no-further, Jersey Sweet, Woodstock Pippin, Northern Spy, Western Baldwin, St. Lawrence, Newtown Pippin, Transcendent Crab, Hyslop Crab, two varieties, name unknown, and four varieties of seedling apples. Other varieties were on exhibition—among them the Ornis, Minnesota Seedling, Goodenough, Rollins, Eyota, and Elgin. Fine specimens of the Delaware, Diana, Northern Muscatine, Clinton, and Black Connecticut seedling grapes were also on exhibition at this fair, as were several other varieties of unknown names.

The first permanent organization of those interested in fruit-culture was effected at Rochester, October 4, 1866. At a meeting called for the purpose, a constitution was adopted and the following named gentlemen elected as officers for the then ensuing year: President, D. A. Robertson; vice-president, Charles Hoag; treasurer, Dr. J. H. Stewart; corresponding secretary, Pennock Pusey; recording secretary, J. H. Brainard.

At this meeting Mr. J. S. Harris is reported as saying that he came from Ohio, where fruit was plenty. He found none here, and his first attempts to raise trees were laughed at by his neighbors. The first lot of trees planted he purchased at La Crescent ten years previous. Fruit from some of the trees he had the pleasure of presenting to those present. Many persons seemed to be afraid to set out trees, but he was satisfied fruit could be raised in Minnesota. He had lost no trees on old cultivated land, but had lost some on new ground. They should be set on ground where early melting snows will run from them and prevent the slush from freezing about the trunk, which is apt to loosen the bark and kill the trees. From two of the trees referred to above he had a few days previous gathered three bushels of apples, which were worth

$15. His Jersey Sweets had stood the climate well. The fruit is handsome, of extra size, and of fine flavor. He claims that no crop to shade the trees should be planted in an orchard. All mulching ought to be removed as early as August, so as to let the ground cool off before severe weather sets in. Leaves and chips are the best manures, as they will restore those ingredients to the soil which have been destroyed by the prairie-fires.

Passing over further details of the early history of fruit-culture in Minnesota, we find that in 1873 the predictions of the early pioneers had been more than fulfilled in the plentiful production of almost all varieties of fruits common to the temperate zone. At a meeting of the Horticultural Society, held at Saint Paul in January, 1873, Mr. Harris gave the following list of fruits as that which had succeeded best with him, viz: Apples—Red and White Astrachan, Duchess of Oldenberg, Saint Lawrence, Baily Sweet, Tolman Sweet, Price's Sweet, Sweet Pear, Tetofsky, Ben Davis, Fameuse, Saxton, Little Romanite, Golden Russet, Seek-no-further, Sops of Wine, Northern Spy, and Transcendent Crabs. Of these, the Duchess, Tetofsky, Red Astrachan, Ben Davis, Little Romanite, and Saxton appear to be the hardiest; but the others stand well, except under very unfavorable circumstances. Of pears, the Flemish Beauty has succeeded best, while among the grapes cultivated, the Concord, Delaware, and Clinton are given the preference. Plums and cherries are very uncertain, while the Wilson strawberry, and the Doolittle Black Cap and Philadelphia raspberries do well. At the close of his report to the society Mr. Harris says:

My orchard being in a hollow, or narrow valley, is protected on the northwest and southwest by bluffs more or less timbered, and the ground slopes toward the south and east. Do not mulch except the first year after planting. Prune but little; think June and November the best time; my experience favors low heads. I give the soil a thorough plowing and harrowing previous to planting, and use no fertilizers. I do not cultivate later than the 1st of July, and grow garden-stuff regularly until the trees and plants require the whole ground.

During a discussion on the subject of grape-culture, Mr. Smith, of Saint Paul, spoke as follows concerning the good qualities of the Delaware and of the proper mode of cultivating the grape:

He had shipped about two tons of grapes to Iowa, Philadelphia, and New York, but had raised more—about four tons. He considered the Delaware the best grape for all purposes. He had picked them from the vine, hung them up in the cellar, and kept them until March. They were the best variety, he repeated, for eating, for wine, for keeping, and all else for which grapes could be used. A child would, if allowed a choice, pick out the Delaware in preference to all others, its flavor never cloying anybody. He had eaten them this season almost ever since August. It was the best grape for the masses to grow. He could not accept old-country notions in regard to grape-culture, and although the Delaware did not stand the hot sun so well on account of the thinness of its leaves, it was an enormous bearer, and would always bring a good price. To raise good grapes requires constant culture until the fall. Indeed, they could not be grown here for less than 20 cents per pound. He can grow strawberries at 10 cents per quart as well as grapes at 20 cents per pound, or wheat at 80 cents per bushel. Grapes require great skill in culture; even professionals spoil grapes. He would not advise any one to plant as a beginning more than a few vines. But he would advise all who had a rod of ground only to plant a few vines at least. His soil was on the bluffs of the Mississippi, and a clay soil on lime rock was to be preferred to any other. The ground should be worked 18 inches deep. It was a laborious undertaking, but they would last years after we were gone. The grape needed deep drainage. If planted shallow they might, the first year, do well, but in a dry spell they would drop their fruit. In reply to a question, he said it took fifteen pounds of grapes to make a gallon of wine; but wine could be produced more cheaply in a Southern climate; still, if we wanted good and fresh fruit, we must grow it here.

Mr. Harris did not indorse all Mr. Smith had said about the Delaware grape. Except that it be grown on a clay soil, he could not recom-

mend it to the public. He thought that for Minnesota the Concord grape was the best of the two. People in Iowa and other States took the same view in relation to the matter. The Crab was the forerunner of all fruits here, and we should, therefore, be grateful for it. It prompted efforts in all branches of fruit-culture. He believed the Transcendent Crab the leading fruit among apples, and he thought the same of the Concord among grapes.

The January (1873) meeting of the society was more important in its results than any previous one. There were able discussions on almost every subject of interest to fruit-growers. A list of trees, both for fruit, forest, shade, and ornamental purposes, suitable to growth in the climate of Minnesota, was adopted. Respecting the injurious effects of the hot rays of the sun to the "south side of trees," Mr. Hamilton stated that the Germans had a very effective way of dealing with this difficulty—that they placed slabs against the trees to protect them from the too hot rays of the sun. They could not afford to wind them elaborately with bands of hay or straw, but slabs were cheap enough. An acquaintance had protected them with heaps of earth, but sometimes they were killed by the hot sun of March. He believed in mulching after the ground was frozen.

Mr. Tuttle was of the opinion that the summer heat caused the trees to flatten and contract on the south side, while the growth elsewhere went on. Protecting the trees with boards in the summer was the practice in Georgia and South Carolina. He had experimented in the case of a tree injured by the sun, and cured it of incipient decay by putting up a board. From his observation and experience he was satisfied that fruit growing paid better than wheat-farming—that this was the case even with grapes. He himself had five acres in grapes. Last year they did well and cost him but very little. There was a vineyard in his neighborhood he would place against any vineyard in America for perfection. The grapes were grown at a cost of 5 cents per pound, and, he repeated, they considered their culture more profitable than the growing of wheat. In fruit-growing he had no doubt but Minnesota would eventually do as well as Wisconsin. He had grown apples for fifteen years, and had never lost a crop yet from the frost. As to grapes, according to the best calculation he could make, the cost of growing them, aside from the boxes, was not more than 1 cent per pound.

In a verbal report made by Mr. J. T. Grimes, of Hennepin County, he stated that among the apples he had fruited were the Duchess, Red Astrachan, Ben Davis, Tolman Sweet, Haas, Fameuse, Pomme Gris, King of Tompkins County, Saxton, Tetofsky, Porrier, and Early June. The Tetofsky, Duchess, and Fameuse were good bearers; so were the Transcendent and Hyslop Crabs. He had last season sold over 100 bushels of the latter at $1 per bushel. As to grapes, he regarded the Concord as a good grower and an abundant bearer, but for table use he preferred the Delaware. When properly laid down, and with reasonable protection, the Delaware did well with him. He had tried thirty or forty different varieties of strawberries, and had fallen back on the Wilson, Green Prolific, and Downer's Prolific. His soil was loam, with clay subsoil.

Mr. Stevens called attention to a specimen of fruit which had been handed to him by Mr. Sweet, of the Northern Pacific Railroad. It was a shrub that grew on the Missouri River in great profusion and in clusters. The berry resembles red currants. The tree or bush was thorny. It grows mostly on the bottoms, but to some extent on the bluffs. It is evidently hardy. It is called the bull-berry, and has been used for

jellies and pies, and is said to make very good ones. It is sub-acid in taste. The shrub would make an excellent hedge, and for that reason he regarded it as a very valuable plant. The berries begin ripening the first of August, and remain on the bush until February. Mr. Grimes said the plant was known to horticulturists as the Buffalo-berry, but Mr. Stevens said this was a mistake, as botanists had not yet been able to place it. One-half of the shrubs produce alternate years.

A committee, previously appointed for the purpose, reported and recommended the following-named varieties of hardy apples for general cultivation: For early autumn—Tetofsky, Duchess. Fall and early winter—Fameuse, Haas, Plumb's Cider. Late winter—Ben Davis. Varieties for trial—Red Astrachan, Saint Lawrence, Autumn Strawberry, Fall Stripe. Early winter—Price's Sweet, Tolman Sweet, Golden Russet, Little Romanite. It was thought best to make no recommendation as to Crabs, but to allow each one to choose such varieties as he might prefer. After some debate, the Perry Sweet, Golden Russet, and Little Romanite were added for trial.

The committee on seedling apples reported that at the exhibition at the State fair more than fifty varieties were shown as fruiting in the State, which, for size, beauty of appearance, and flavor, were equal to any of the standard varieties grown in the older States. The first premium was awarded to Jacob Kline, of Houston County, for a large and fine autumn apple.

After a somewhat protracted debate, the following-named varieties of evergreen, ornamental, and shade trees were recommended in the order in which they are named: Norway spruce, Austrian and Scotch pines, European larch, balsam fir, American arbor vitæ, American black spruce, white spruce, red cedar, Siberian arbor vitæ; for ornamental trees, the mountain ash and white birch; and for shade-trees, white elm, bass-wood, white ash, box elder, rock maple, soft maple, butternut, walnut, and hackberry. For wind-breaks, American larch, beech, and hemlock were recommended.

After a discussion on the subject for the proper distance in setting trees in fruit-orchards, the following resolution was adopted:

Resolved, That it is the sense of this society that 30 feet is the proper distance between orchard-rows, with evergreens between, and that trees should branch at the height of 3 to 4 feet.

After consultation the following resolution was adopted:

Resolved, That we recommend to persons, for general planting of evergreens, to procure none but small trees; those that have been transplanted once or twice; and that we recommend the time for transplanting from the 15th of April until the 25th of May.

In closing their labors, the committee having charge of the compilation of this work call attention to the fact elicited by the discussions of the society, from year to year, that, in a great measure, the trees and shrubs selected or pronounced upon as hardy, in the outset, have stood the test of experiment ever since.

NEBRASKA.

The fourth report of the Nebraska State Board of Agriculture, published in 1873, contains the proceedings of the board for two years, 1871-'72, the list of premiums offered and awarded at the annual State fairs for these years, essays on various subjects of interest to the western farmer, and a large collection of interesting facts relating to the

geology, topography, climate, and soil of Nebraska. The State fair for 1871 was held at Brownville, commencing on the 26th of September and continuing four days. That for 1872 was held at the city of Lincoln, four days, commencing on the 3d of September. Both fairs were successful, financially, as well as in other respects.

The president, in his annual report to the State board, congratulates the people of the State on the progress of agriculture and all matters connected therewith during the past two years. The country is fast filling up with a class of intelligent and enterprising farmers, who, by their example, are creating a new interest in everything which pertains to the progress and success of the productive industries of the State.

In accordance with an act of the Legislature, passed in 1869, providing for the establishment of a State Agricultural College, the regents arranged for the opening of the same in the fall of 1872, with two professors, and a practical farmer to take charge of the experimental farm and superintend the improvements thereon. Two sections of land have been secured for this farm, and notwithstanding a want of funds, many permanent improvements have already been made. None of the lands donated by the Government as an endowment to the institution having as yet been sold, an appeal is made to the farmers and stock-growers of the State for donations of stock and implements, to be used in supplying and improving the farm, and as a means of furnishing instruction to the students.

The report contains a very interesting lecture on the geology of Nebraska, by Prof. Samuel Aughey. He is of the opinion that the physical character of Nebraska indicates the existence of a plentiful supply of coal. Vast beds of lignite exist in the Cretaceous deposits in Wyoming. Coal of a like character is also found on the eastern slopes of the mountains at many points between Cheyenne and Denver, over a region covering hundreds of miles of territory. The conditions which resulted in the formation of the lignite on the mountain-slopes were the conditions of Nebraska at the same periods of time; therefore the people of the State are justified in looking for coal as well in the Tertiary as in the Cretaceous deposits.

The cultivation of the sugar-beet, and the manufacture of sugar therefrom, are attracting much attention among the farmers of this State. The president of the board, in order to give the best information attainable on the subject, has inserted the full report of Prof. Charles A. Goessmann, of the Massachusetts Agricultural College, as published in the eighth annual report of the trustees of that institution. A few experiments have been made in the cultivation of the beet in Nebraska, and the conditions of soil and climate have been found excellent for its production. Prof. S. R. Thompson, of the Agricultural College, states that during the past season, with ordinary field-culture, he raised on one-tenth of an acre the White Silesian sugar-beet at the rate of twenty and one-half tons per acre. Others, it is also stated, did quite as well. Some of these beets were placed in the hands of Professor Aughey for analysis, and the following is given as a brief summary of the result:

Number of beets analyzed	19
From neighborhood of Omaha	3
From neighborhood of Lincoln	16
Average amount of sugar	13.5 per cent.
Average amount of grape-sugar	.50 ditto.
Average amount of potassa and soda compounds	.43 ditto.
Average amount of lime and magnesia	.18 ditto.
Average amount of nitrogenous compounds	.78 ditto.

The following results of experiments in the cultivation of the sugar-beet on the college-farm grounds during the past season, are given by Professor Thompson:

Variety of beet.	Source of seed.	Weight in pounds.	Percentage of sugar in juice.
I.—Vilmorin beet	Saxony.	⅝ to ⅞	15.50
II.—Vilmorin beet	ditto.	¾ to 1	15.61
I.—White Imperial	ditto	¾ to 1¼	14.20
New Imperial	ditto.	1¼ to 1¾	13.60
I.—White Magdeburg	ditto.	1½ to 2	13.10
Quedlinburg	ditto.	1½ to 1¾	13.44
II.—White Imperial	ditto.	1½ to 2	10.27
II.—White Magdeburg	Silesia.	1¼ to 1¾	10.06
White Silesian	ditto.	1¼ to 1½	9.72
III.—Vilmorin beet	ditto.	1¼ to 1	9.93
Long white beet	ditto.	1¼ to 1¾	8.60
White sugar-beet	ditto.	1¾ to 2	7.20
Vienna red beet	ditto.	1¾ to 2	8.10

The soil of Nebraska is naturally rich, and well adapted to the growth of all kinds of root-crops.

The report contains, in addition to articles previously mentioned, returns from a number of county and district societies, a large amount of statistical information condensed from the late census returns, and several essays on forest-tree culture. The last-named subject seems to be attracting a great deal of attention among the citizens of this State, and a considerable portion of the work is devoted to essays relating to the planting and best methods of cultivating forest trees, profits of tree-culture, &c.

A premium essay on the best breed of hogs for Nebraska, and the most economical way to manage them, is contributed by Mr. Irving L. Lyman. The writer, after giving his unqualified preference for the Butler County breed, known also as the Poland-China or Magee, gives the following as his reasons for this preference:

First. That as breeders they are notably and uniformly prolific, it being common for young females at their first bearing to produce a full, even litter of from nine to twelve fine pigs.

Secondly. They are uniformly, perhaps invariably, kind and careful mothers, and copious nurses, qualities which constitute a strong prepossession in their favor from experienced breeders, and in which their black rivals are conspicuously deficient.

Thirdly. They are healthy, vigorous, and hardy to a remarkable degree, and are entirely free from mange or other cutaneous affections; bear the intense cold of our winters and the heat of our summers with equal indifference, and in this respect are undoubtedly the best breed that can be propagated in Nebraska.

Fourthly. They are well and favorably known for their great docility, and quiet, tractable habits, thus greatly diminishing the amount of care and labor necessary to keep them in their confines, and enabling them to appropriate their food to the laying on of flesh and fat, instead of expending it in useless and unprofitable motions about the pens and field, an important consideration when we reflect on the uneasy movements of many of the lighter breeds. Being docile and of a quiet disposition, they are peculiarly susceptible to the influence of good feeding, and under such influence make a most rapid and satisfactory gain.

Fifthly. They are the earliest matured of all the large breeds, deriving, as they do, from an infusion of Big-China and Irish Grazier blood, the capacity to fatten at any age from four months to three years. They have been made to average, in lots of thirty head and over, at eleven months old, dressed, from 389 pounds to 410 pounds.

Sixthly. They attain the heaviest weights. No other large breed can compare with them, except, perhaps, the Chester Whites, which have too many deficiencies to ever become a predominant breed in Nebraska.

As to the best and most economical system for the management of hogs, Mr. Lyman says:

There are many theories, but few of them stand the test of practice. I would have my sows pig during the months from April to July, inclusive. September might also

be permissible. Pigs produced in cold weather give but poor satisfaction, and are generally a vexation and loss. Sows should be put in a floored pen a few days before delivery; this should have poles around the sides, raised seven inches from the floor, and the same distance from the wall. With this arrangement I rarely lose a pig by being crushed under its dam. I also allow but a scanty bed for the first two days. Give only sloppy, unstimulating food for that time, and after that increase the strength gradually until a week has passed, then the dam should have all the hearty, milk-producing food she will take. Ground feed is always the most satisfactory for sows with pigs. Bran-shorts or screenings are relished, and give good results. If you have plenty of cow's milk, all the better for both mother and young. Wean at seven or eight weeks old, giving after that all the milk you can spare—phosphatic and nitrate, or bone and muscle-making food, such as bran-shorts, screenings, and oatmeal. I think there is far better food than corn for young pigs until four months old; roots, such as potatoes, and pumpkins, and squashes, are excellent for young stock, in fact for all, and the value of all these, grain as well as roots, is doubly enhanced by being cooked. * * I cannot close this essay without urging upon my brother-farmers of Nebraska the importance of the beet-crop as food for swine. I am not fully convinced which is the best and most profitable kind to cultivate, but either the mangel-wurzel or the sugar-beet is superior food for hogs at any age. They devour it with avidity, preferring it to corn, and, when supplied together, putting on flesh and fat at a most astonishing rate when furnished liberally and regularly. No swine-breeder or pork-raiser will deprive his stock of this important auxiliary to his stores who has once tried it and witnessed the wonderful results of its use.

Mr. J. H. Gregg makes the following statement of his experiments with live or hedge fences:

In the spring of 1867 I planted in Otoe County three and one-third miles of Osage-orange hedge. About the 10th of May I staked the ground where the hedge was to be planted, it then being raw prairie. With a good plowman I commenced turning over the sod with a strong team, and with another, using a common stirring-plow, followed, turning up the soil six inches deep; in all, preparing a strip a rod wide, and then with harrow and heavy roller prepared the ground and pulverized the soil as carefully as if for onions.

The line, marked with red every eight inches, was stretched, and the planting commenced. A man with a spade inserts it as deep as the blade will permit, raises the handle, while a boy with plants in a bucket of water, inserts one in the hole between the spade and the line; the spade is withdrawn, and the foot pressed firmly against the loosened soil, packing it well about the roots, while a man with a hoe follows, drawing the earth from both sides about the plants. In this way a man and boy will set about a hundred rods per day. Most all the plants grew, and where failures occurred the vacancies were filled the following spring.

The first and second years plowed and hoed twice; the third year plowed twice without hoeing, no weeds of any amount interfering with the growth, and a sharp lookout was kept for gophers. It has made a very even growth each year, and now there are many places eight rods in length without a break, and no stock of any kind will attempt to go through it. The plants used were grown by myself from seed.

A writer on the subject of forest-tree culture gives the following advice in relation to planting trees along public highways:

One feature in tree-growing which we trust will receive proper attention at an early day, is the planting of trees along the highways. Nothing would add so much to the beauty of a prairie-landscape as avenues of lofty trees and hedge-rows. In a country where our roads need so little labor to keep them in repair, it would seem advisable to expend a portion of the road-tax, under the direction of the overseers of highways, in planting trees on each side of the public roads. These, in summer, would be the resort of thousands of our insectivorous birds, the value of which to an agricultural region has not been overestimated. The grateful shade the trees would afford would be appreciated by every traveler, and growing as they would on land that otherwise would waste or grow up in weeds, the return from the only expense, planting, would be certainly most satisfactory. At present, if nothing else could be had, we would say plant cotton-woods, on account of their rapid growth, but as soon as possible set between them hard maple to ultimately take their places. The fine form of this tree, with its close, symmetrical head, and clean foliage, makes it the most desirable tree we can find for street planting, and one which no doubt will grow rapidly on our rich prairies. Next come the elm, ash, and box-elder, each of which is valuable for this purpose, and makes a fine effect if interspersed with an occasional bass-wood and sycamore.

The great scarcity and consequently high price of black-walnut lumber is directing attention to the cultivation of this valuable tree on the

western plains. A writer in this volume gives the following directions for planting the seed and the proper care of the young trees:

The nuts should be planted as soon as they fall, four feet apart and three inches deep. The first year they will make a growth of ten to twelve inches, the next thirty, and the third they will be of sufficient size to render cultivation unnecessary. The first two years the ground might be cultivated with some crop. This tree, striking a deep root, is not liable to obstruct cultivation, hence it would be valuable for division-fences. At one or two years it can be transplanted with general success, in which case the tap-root is generally shortened to induce a growth of roots which spread out near the surface, and this may account for its early maturity. Mr. Hollenbeck reports that a fair average of a tract of forty acres planted in the spring of 1865 measured 22 inches in circumference and 25 feet high in 1871. Some of them bore nuts in 1869, and quite a number produced a peck or more in 1871.

Our soil is admirably adapted to the growth of the walnut, the main root striking down till it reaches the yellow subsoil, which is a depository of moisture. This may to some extent explain the luxuriant growth of our fruit-trees, and their tardiness in bearing. As soon as the roots find this reservoir, in connection with our rich surface soil, combining the elements of growth, they shoot up, producing strong terminal buds and spending their strength in the production of wood, which is rapidly formed from the large flow of sap consequent on the moisture at the roots. This peculiarity of our soil might be an argument in favor of planting the oak, walnut, and other nut-bearing trees, which draw their support from a locality independent of drought. The number of nuts required to plant an acre, four feet apart, is three bushels, with the husks on, or one and three-fourths if cleaned. The planting can be done rapidly, furrowing the ground both ways and dropping a nut at each intersection, covering with the plow. If the nuts cannot be planted in the fall they should be buried, and by no means allowed to dry. With proper care there will scarcely be a failure, and the farmer who plants a grove of even 40 acres will realize, before ten years from this date, that the value of these trees for timber is vastly more than was anticipated.

The same writer speaks as follows of the cotton-wood tree:

The cotton-wood is an invaluable tree for the beginner in Nebraska. Young plants or cuttings are easily procured, and almost certain to grow with little care and slight expense, furnishing shelter and fuel in a shorter time than any other tree. Specimens are growing in Douglas County which at thirteen years measure 22 inches in diameter, and a thousand of these might grow on an acre. One planter we met recently says he has a tract of several acres planted, which are seven feet high from cuttings planted last spring, or six months ago. To those who are just making a beginning on the open prairie, we would say plant a belt of the cotton-wood the first year, if possible, for a protection to a future orchard, and it will be certain to give a most profitable return.

Mr. E. Ferrand makes the following suggestions in regard to the planting and care of evergreens:

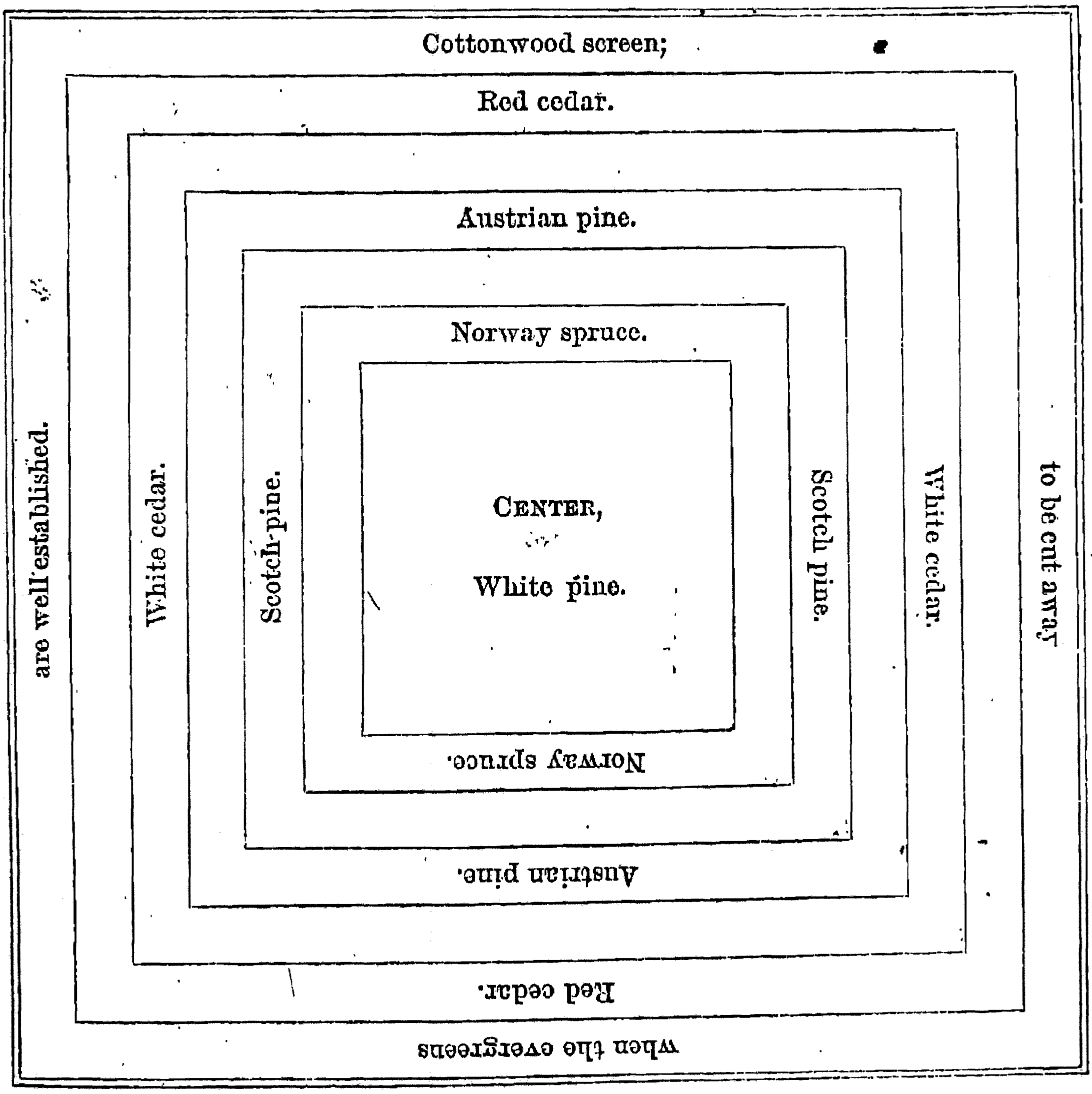
First. Never plant your evergreens in the fall of the year, but do it in the spring, as early as you can obtain the trees. Secondly. Do not set your trees in the ground deeper by an inch than they stood in the nursery. Use no manure of any kind in planting evergreens or larch, but let the soil be mellow and friable, without lumps in contact with the roots. Thirdly. Do not plant trees under two years old, even for stocking a nursery, and for the garden and the lawn give the preference to trees one to three feet high. Fourthly. Never dig deep among the roots of your trees, but keep the soil mellow and moist at the surface by a light mulching of bruised straw or hay, that will prevent the weeds from growing.

In the course of an essay on timber planting and forest-tree culture, Mr. J. H. Davidson says:

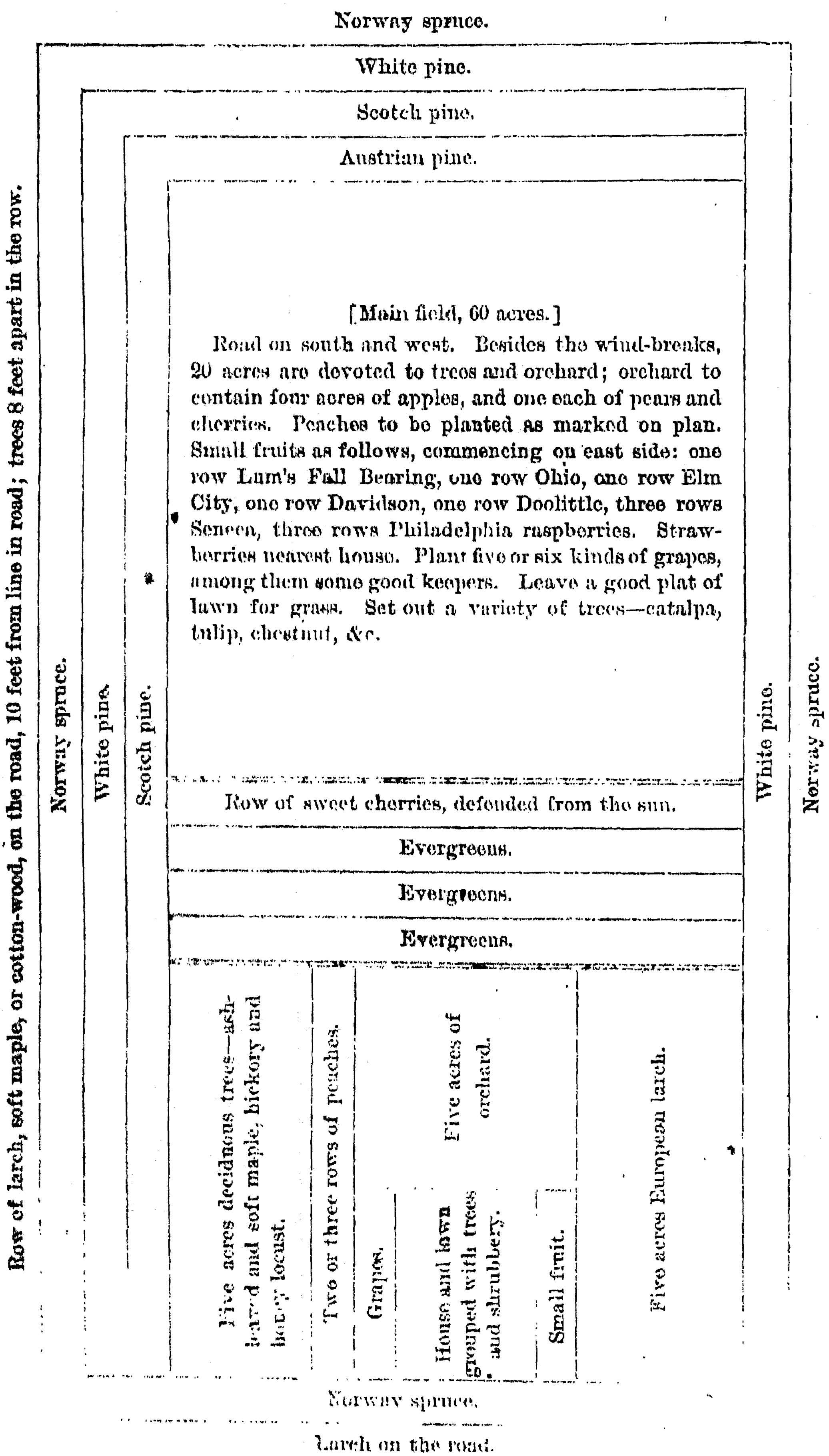
The best method of stocking our prairies with timber is to prepare the soil precisely the same as you would if you were going to raise a large crop of corn. The quickest way to raise a grove is with cuttings of cotton-wood or willow. I plow, drag, and mark the same as for corn, four feet each way, which will give 2,722 hills to the acre. I should plant one half to trees, four feet one way and eight the other, making 1,361 trees, and the other in corn for two years, to pay for cultivation, and that is all the cultivation needed. I should adopt the same plan in planting acorns, hickory-nuts, white and black walnuts, soft maple, elm, and ash, where the sprouts are one year old. White pine, arbor vitæ, red cedar, European and American larch, when large enough to transplant, require more cultivation. I estimate the cost of preparing an acre and getting the cuttings of soft maple or ash, at $3 per acre. A man can plant two and one-half acres per day. This is all the cost for ten years. Perhaps you will ask, "Nothing for the use of the land?" Yes, $3 per acre. According to my last year's

taxes, I had to pay 3 per cent. on the assessed value, and as the State exempts $100 on every acre planted in timber, you see there is your $3 per acre for the use of the land, a fair renting value. I have 1,361 trees per acre; seven years from planting I will cut one-fourth, or 340 trees, equal to fifteen cords of wood; the eighth year fifteen cords more; the ninth the same; the tenth year you see my profits. I should cut what is left, 456 trees, allowing four trees to the cord, so as not to overestimate it. I have several trees only ten years old which are 14 inches in diameter and 50 feet high; four I think would make a cord; I allow six trees to the cord, making seventy-six cords, and forty-five cords cut before, make one hundred and twenty-one cords. At $3 per cord, allowing $1 for cutting, I find I have $242. I contend that five acres planted to cotton-woods, after a growth of seven years, will furnish one family with fuel for one stove a lifetime, and sell enough to pay for the use of the land besides. I claim, after fifteen years' experience in tree-planting on this plan, that the white willow (*Salix alba*) is equal to soft maple for wind-breaks and fuel, and superior to all trees for rapidity of growth, as well as good for timber. Chestnut, too, is superexcellent.

The following design is given for the planting of trees on a level piece of ground so as to give the grove the appearance of having been planted upon a hill or mound: the tallest-growing trees are planted in the center, the least thrifty next, and so on until the outer row is reached. The rows are 80 feet apart, and the trees 8 feet in the row. The center should be planted somewhat thicker, in order to make them shoot higher:



A plan, which is herewith reproduced, is also given for laying out a quarter section of land, with proper wind-breaks of timber trees:


Norway spruce.
White pine.
Scotch pine.
Austrian pine.
[Main field, 60 acres.]
Road on south and west. Besides the wind-breaks, 20 acres are devoted to trees and orchard; orchard to contain four acres of apples, and one each of pears and cherries. Peaches to be planted as marked on plan. Small fruits as follows, commencing on east side: one row Lum's Fall Bearing, one row Ohio, one row Elm City, one row Davidson, one row Doolittle, three rows Seneca, three rows Philadelphia raspberries. Strawberries nearest house. Plant five or six kinds of grapes, among them some good keepers. Leave a good plat of lawn for grass. Set out a variety of trees—catalpa, tulip, chestnut, &c.
Row of sweet cherries, defended from the sun.
Evergreens.
Evergreens.
Evergreens.
Five acres deciduous trees—ash-leaved and soft maple, hickory and honey locust.
Two or three rows of peaches.
Grapes.
Five acres of orchard.
House and lawn grouped with trees and shrubbery.
Small fruit.
Five acres European larch.
Norway spruce.
Larch on the road.
Row of larch, soft maple, or cotton-wood, on the road, 10 feet from line in road; trees 8 feet apart in the row.
Norway spruce.
White pine.
Scotch pine.
White pine.
Norway spruce.

At a meeting of the State horticultural society, held August 6, 1872, a lengthy discussion occurred on the merits of the different varieties of fruits exhibited. The following-named varieties were finally recommended for general cultivation:

Apples.—Early Harvest, Red June, Buffington's Early, Red Astrachan, Early Pennock, Sweet Bough, Sweet June, Early Joe, Summer Queen, Duchess of Oldenburg, Hawley, Sheep Nose, Cooper's Early White.

Pears.—Buerre Guifford, Tyson, Bloodgood.

Peaches.—Trath's Early was highly recommended.

Plums.—Jefferson, Green Gage, Duane's Purple, and Red Gage were all regarded as worthy of cultivation.

NEW JERSEY.

The annual report of the New Jersey State Agricultural Society for the year 1873 is printed in pamphlet form, and covers about 200 pages. In addition to the list of premiums offered and awarded, and the usual business transactions of the society, the report contains some very valuable essays on topics of great interest to the farming community generally.

The president of the association, in his annual address, regrets that it has become so common a thing to speak of the Atlantic-coast States as worn out and exhausted. In refutation, he states it as an indisputable fact that Long Island alone, if cultivated in wheat to its highest capacity, could produce as much annually as the rest of the State of New York; that is to say, 9,000,000 bushels. He thinks that Monmouth County alone might be made to equal this enormous production. He further states as his belief that the annual yield of the entire State of New Jersey, if cultivated to its highest capacity in wheat, would undoubtedly surpass the entire present yield of all the New England and Middle States.

The corresponding secretary, in his annual statement to the board of directors, says:

According to the census-returns of 1870 we have in New Jersey 2,989,511 acres, all told, in farms. Of these there are 1,976,474 acres improved land, 718,335 covered with wood, and other unimproved 205,702 acres. From these figures it will be seen that the percentage of improved land is in round numbers 66 per cent., and the total value of farming land in the State amounts to the large sum of $257,523,376. Although having a much smaller area than many of her sister States, still the advantages of good home markets has had a marked effect on our agricultural interests, and there has been in consequence a steady rise in valuation from year to year until now, when the valuation of our farming land is placed at $86.14 an acre, which is much higher than any other State in the Union, a fact worthy the attention of agriculturists. Following close upon this important point comes another equally so that will afford food for reflection not only to our own farmers, but also those of other States—that is, the value of improved farm-implements used in our State sums up to the amount of $7,887,991, giving for each acre of improved farming land $3.99 in labor-saving tools, which again places New Jersey at the head of the list of States in this respect. * * * For every acre of farm-land in the State we find a return of $14.29, and calculating on the basis of improved land, this sum is increased to $26.61, a showing that will bear comparison very favorably with that of any other State, although it is patent that these figures by no means cover all the farm-products of the State. Twenty per cent. added would not more than come up to the actual returns.

The wheat-crop of the State for the year 1873 is given at 1,948,800 bushels, an excess over the crop of 1872 of about 68,800 bushels. The aggregate value of corn, wheat, rye, oats, barley, buckwheat, potatoes, and hay produced in the State during the year 1873 is estimated at $26,599,990. In addition to these crops there are large revenues resulting from the culture of apples, pears, peaches, strawberries, cranberries,

&c. The strawberry-crop alone, during a favorable season, is estimated at 2,000,000 quarts, worth about $300,000. The total value of the live stock of the State is given at $28,335,133.

The secretary of the society, in his report, thus speaks of the value of marl as a fertilizer:

The use of marl as a fertilizer has worked wonders in Monmouth, Ocean, and Burlington Counties, and the best proof of its value is found in the increased consumption among practical farmers in these southeastern counties, and the large crops grown on the sandy lands where marl is applied liberally. The average products in these counties have steadily increased. It is hardly half a century since marl was first made use of in Monmouth County as a fertilizer, and from then until now it has been gaining in popular favor among practical farmers, until at this time the consumption counts millions of bushels annually. The aggregate deliveries of the different marl companies of the State for railroad-transportation for 1873 are given at 2,539 080 bushels. In this there is no record of the large bulk hauled direct from the pits by farm-wagons; and, again, there are a great many farms in these counties where a good quality of marl is dug for home use, which, if added, would swell the above figures considerably.

Mr. Nathaniel S. Rue, who contributes a brief article on the value of marl as a fertilizer, says:

Viewing the subject of marl as a manure, in its bearing upon the public welfare, it becomes an exceedingly interesting consideration, especially to New Jersey farmers, that there exists below, and lying near the surface soil throughout a district so extensive, a mineral substance gathered from disintegrated rocks, the *debris* of ages of vegetation, mingled with the remains of many races, both land and marine, all composted beneath the ocean-waves, and made into a mine of manurial wealth, containing so many of the elements of plant food and growth so admirably fitted to supply the demand in its economical and assimilated form.

One of the chief virtues of marl is its retentive quality as a fertilizer, that, while it gives generously, it is never a spendthrift of its resources. Its fertilizing power is so securely locked up in the little greensand-granules that it defies wastage by any of the ordinary agents that disperse so unsatisfactorily the manurial elements of so many of our fertilizers, both mercantile and home-made.

Prof. G. H. Cooke, State geologist, after giving an analysis of the New Jersey marls, speaks as follows of their productive properties when applied to different crops:

A load of Squankum marl, perfectly dissolved and mixed with the soil of an acre, would give for a clover-crop, of lime sixty-odd pounds, not quite enough; of phosphoric acid 70 pounds, thrice too much; of magnesia 40 pounds, about twice as much as the clover uses; of potash 75 pounds, just the required amount; of silica 1,000 pounds, while only 15 are used; and of oxide of iron 320 pounds, only one being required. The marl has given no salt, of which the clover-crop needs 7 pounds. In this way it is easy to arrive at the value of marl as a fertilizer. Add 50 pounds of potash and 10 of salt to a load of marl, and you have a fertilizer which is good for a crop of 150 or 200 bushels of potatoes on an acre. Add lime and a little salt, and you have a special fertilizer for clover.

The best mode of applying marl to the grain-crops is to sow it in winter or early spring on clover. When the clover is vigorous, as it will be early in May, turn it under and put corn on the sod. This will give the phosphoric acid of the greensand a chance to act on the decaying clover, and the best sort of plant-nourishment is thus produced. As a month or more may elapse before the marl and clover have time to do their work, it is best to supply corn thus planted with a little ammoniacal manure in the hill or on the surface at the first hoeing. When, in July, the roots strike down through and beneath the sod, the phosphoric acid and potash of the marl, acting with the nitrogen of the clover, will supply the materials for a full and flourishing crop of corn. If wheat is to be sown in the fall, the best way is to cut a crop of the clover about the 15th of June. By the middle of August the second crop will be rank. Turn it under, and in a month sow the wheat on the sod. For wheat it is well to top-dress the clover, before it is turned in, with a few bushels of lime to the acre, unless a marl rich in carbonate of lime is used.

In applying marl to grass-lands the farmer has an advantage. He can do that when no other field-work is possible. It is best to spread marl on grass late in the fall or early in the winter. In fact it makes no difference—any time from November to March, inclusive. The same is true of lime. They may be used together, or, what is better, give grass-lands a top-dressing of lime first, and the following winter spread on the marl at the rate of a hundred bushels to the acre.

A writer over the initials of "J. P.," contributes a very interesting paper on the subject of breeding and training horses. He is of the opinion that as you study your horse so your horse will study you. If you are a coward your horse will soon become one. If the driver pulls quick upon the rein when his horse jumps a little one side at anything he fancies he sees, and by that action giving his horse to understand that he is also frightened, the next time the horse fancies he sees anything he will be much more frightened than before, and the driver will pull twice as hard and sudden; and, perhaps, to make the matter still worse, hit him a cut with the whip to punish him for what he could not help. He relates an instance of a very pretty mare he purchased at a very low price, because her owner was afraid to drive her on account of her skittishness. He commenced by driving her at a very slow gait, and was careful not to let her know that he even noticed her when she shied. The consequence was, that she soon became disgusted with her own foolishness, and thereafter proved a quiet and docile driver. On the subject of breeding for gait, the writer says:

Let me call your attention to a pet idea of my own, one I have never heard of being advocated, which is that the pacing gait is the best to breed from on the side of the dam. My reasons are that the pacing gait is between the trot and the run, and consequently faster than the trot; the stride is greater in the pacer, and all of our fastest horses have a sort of shuffling pacing gait when starting into a trot. These reasonings have led me to notice the produce of the cross of trotter and pacer. Old Pocahontas, probably the fastest pacer in the world, has had some five or six colts, all of which (those that have been put to trotting) have shown under 2.25, and young Pocahontas under 2.20, and all square trotters. We also know that fast pacers, when they strike the trot, as they generally do, under present knowledge of how to change the gait of the pacer to the trotter by loading the front feet, trot very fast. Were I in the business, or were I to commence the business of raising horses, my first step in procuring brood mares would be to scour Canada for fast-pacing mares, not Canucks, but good blooded mares, and they have them in Canada as well as here. My reason for going to Canada would be that there are many more pacers in Canada than in this country, from the fact that the pacing gait there is not as objectionable as it is here, and has been encouraged more. Another reason is it is a cold climate, and the horses are more hardy and tough. I don't mean to say that I would confine myself to that class by any means, for I would want some of other kinds; for instance, a fine Patchen mare, crossed with Jay Gould, would be sure to be a trotter.

Mr. E. W. Crane contributes an article on the subject of the introduction and cultivation of the cranberry in New Jersey. The American cranberry (*Vaccinium macrocarpon*) is found in most of the States, and as far north as Alaska. It is much larger than the European variety, and of greatly superior flavor. It is generally of a darker and brighter color when mature; while growing it is of a light green, which changes in ripening to a light or dark red or crimson, and sometimes to a mottled color, the berry being from one-fourth to one inch or more in diameter. It blossoms in June, and the fruit ripens in September or October. The runners of the vines are from one to eight or more feet in length, with small oblong leaves. It may properly be called an evergreen, though the leaves turn to a brownish hue during the fall, especially when the vines have been cultivated and set in sand.

The American cranberry is divided by growers and writers into three different varieties, viz., the Bell cranberry, so called because of its fancied resemblance in shape to a bell; the Bugle cranberry, which somewhat resembles a bugle-head, is elongated and approaches an oval in shape; the Cherry cranberry, which is similar in size, shape, and color to the cherry. These varieties run together and produce intermediate ones. The vines also differ; some are of a shorter growth than others, and apparently produce more fruit; these, of course, are to be preferred.

Mr. Crane states that the first attempts to cultivate the cranberry in

this country were made by Mr. Henry Hall, of Dennis, Mass., on Cape Cod, in the year 1812. He sold his first crop for from $1 to $1.25 per bushel. The original vines planted by Mr. Hall, more than sixty years ago, are yet standing, and two years ago bore a fair crop of fruit. The greater part of the land adapted to the cultivation of this berry on the Cape has long since been occupied, and much of it produces large crops. New Jersey exceeds all other States in the cultivation and production of this fruit.

Mr. John Webb, of Ocean County, was the first successful cultivator of the cranberry in this State. He began his experiments in 1843, and it was five years before he realized his first crop of 10 bushels. His next crop was about 60 bushels, and it has since varied—two or three failures excepted—from 1,500 to 2,000 bushels. His bog is in a high state of cultivation. He has been offered, and refused, $1,500 per acre for it.

The great cranberry-growing district of New Jersey is composed principally of parts of the counties of Ocean, Burlington, and Atlantic, though small portions of Monmouth, Middlesex, Camden, Cape May, and perhaps one or two other counties, are adapted to the growth of this fruit. The greater portion is located in the region known as "The Pines"—a region containing about 1,200,000 acres, most of which has until recently been uncultivated.

The best locations for the growth of the cranberry are peat or muck bottoms, with adjoining banks of pure sand for covering the plantation before the vines are set, and so situated that they may be completely flowed by living springs during the winter, as well as thoroughly drained at other seasons of the year. Many growers have a preference for cedar-swamps, and (although other bottoms are sometimes equally as good) they are considered, when favorably located, as rather the surest, though more expensive to work. They also grow well on good savanna—a mixture of peat and sand—but not so abundantly, nor do they last so long as on muck bottoms. Mr. Crane says:

In preparing a plantation the surface must first be cleared of the wood, timber, or brush; then it must be "turfed"—that is, the surface-soil and roots must be taken off with a hoe made for that purpose. The next step is to ditch it, by clearing out the main water-course and digging side drains running into it—generally in deep bottom-lands, about one and a half or two rods apart, but the distance should be varied in accordance with the nature of the ground. The floats removed in turfing are used for leveling up low places where needed, so that the surface may be slightly rounded between the side drains; they are also used for building the dam, which is constructed with two walls of the floats filled in with sand, a ditch having first been cut between them to the sand beneath; the solid filling makes it water-tight.

After turfing and ditching, muck bottoms must be sanded to the depth of from four to six inches with pure sand, without mixture of clay or loam, and it should be taken from a sufficient depth below the surface to avoid seeds. The silex imparted to the vine from the sand stiffens it, materially promotes its productiveness, and tends also to prevent the growth of weeds. Many experiments have been made to ascertain the proper depth to which the sand should be applied; where little or none is used the vines grow long and slender, and do not fruit so well as when sanded. While some have thought two inches sufficient, others have tried a thickness of twelve or more, and with good results—though with this amount the vines make a slower growth, on account of the length of time required for the rootlets to reach the peat beneath, from which they draw their support. Most cultivators have concluded that from four to six inches, and resanding every few years with a layer of from one to two inches, is preferable to using a much larger quantity at first.

After sanding the vines are set in rows about twenty inches apart, and but a moderate quantity of vine should be used for each hill. This is the usual method, though the distance is often varied each way. Mr. D. R. Gowdy, of West Creek, one of the original cultivators, from recent experiments has concluded that the vines should not be set over a foot apart, and that the additional cost of the vines, &c., will be more than paid by earlier and larger crops, as well as by the matting of the vines in much less than the usual time, which keeps down the other vegetation, and saves labor and expense in cleaning. Mr. N. H. Bishop, of Manahawkin, has successfully adopted the

method of layering the vines, or placing them in furrows in the sand, with which they are entirely covered to the depth of about one and a half inches. Vines grow finely by this method, but great care must be taken to keep them moist. Wild vines have generally been preferred to cultivated ones for setting, from the fact that they appear to grow more vigorously at first, especially if the season is a very dry one.

Savanna-land can be plowed, and does not need sanding; this is a great saving of expense, but as large crops cannot be expected as from bottom-lands. Where possible on land of this kind, the turf not needed for the dam should be plowed or dug under the sand, as it is often the richest part of the soil, and is well adapted to the growth of the plant.

Plantations should be well flowed from December until May. The water fertilizes the vines, protects them from frost, and is the only reliable remedy known for the vine-worm, which is one of our worst enemies. It is thought that the warmth of the water, where held on the vines until the 10th or 15th of May, destroys the eggs deposited on the leaves the previous year; hence the advantages not only of late but thorough flowing, as the portions not flowed often constitute a hatching-ground for the worms, from which they spread to the adjoining grounds, though it has been noticed that they apparently prefer not to go much beyond the water-line if they can find sufficient vines that have not been flowed.

Estimates as to acreage, amount of crop, &c., within the State, are given as follows: Number of acres of cranberry-bearing land, 4,000; number of acres cultivated, not yet in bearing, 3,000; number of acres wild, 10,000 to 12,000; crop of 1873, 125,000 bushels; average price of crop of 1873, $2.50 to $3.75 per bushel.

As to the value of cranberry-plantations, average yield and income per acre, Mr. Crane says:

At four years of age good plantations have been said to have an average value of $1,000 per acre, though the price varies, of course, according to the demand and the supply, location, quality, &c. Some owners have refused $2,000 per acre for their lands, while others could not sell for the original cost.

An average of 100 bushels per acre for a plantation, though not an immense yield, is considered a very good one. Many have exceeded it, but many more have fallen below, and probably an average crop for all classes of land, in a good season, would not exceed from 50 to 75 bushels per acre. Probably the best crop on record was that of one acre of the celebrated Oxycoccus plantation of Mr. N. H. Bishop, of Manahawkin, in 1872, from which were sold 423 bushels for $1,809 gross, though parts of acres have yielded at higher rates than the above. A few rods of one of our own plantations yielded, during the past season, at the rate of over 700 bushels per acre, and larger rates still are reported for one or two rods; but these, of course, are exceptional cases. Single crops, however, have often paid 50 per cent., and even more, on the original cost. Some, however, think that such profits will not again be realized, and it cannot be denied that many have lost money in the business. Some plantations have proved failures, and others, doubtless, will do so, though most of them occur on poorly selected land, on which the work has, perhaps, been imperfectly done at first, and afterward neglected. To attain success, experience and close attention to business are necessary, and so much patience that cultivators often think their profits dearly earned when successful.

Several other brief essays on subjects of much interest are contained in this report, but a lack of space forbids special reference to them.

NEW YORK.

The report of the New York State Agricultural Society for the year 1871 contains, in addition to the usual business transactions of the association, a large amount of useful information on almost every subject relating to the farm and the dairy. The volume is well printed, is embellished with some well-executed engravings, and contains, in all, about 850 pages. It is among the most creditable and valuable reports yet issued by this association.

The secretary states that the season of 1871, as compared with that of 1870, was alike in the extreme drought experienced throughout the State, but different as regards temperature, being much more moderate

and equable. The crop of wheat was excellent, both in quality and quantity. Returns of 40 bushels of white winter wheat per acre were frequent, and as high as 45 bushels per acre were reported in one or two cases. In most of the grain-growing counties spring-grain was reported as having given full average crops, even where there had been least rain. Corn was thought to be under the average, as some of the best corn-growing counties—Monroe, Wyoming, and Gates—reported largely diminished yields. The hay-crop was light, though of excellent quality.

The effects of the drought were most felt in the dairy-districts, and it was feared that the diminished returns from this important branch of agriculture would occasion actual distress in some counties whose marketable surplus consists chiefly of dairy-products. In addition to the drought, immense numbers of grasshoppers appeared early enough to inflict considerable damage upon the grass intended for hay, and afterward devoured a large share of pasture-grass, besides injuring late fields of spring-grain and much corn while in the silk. The secretary says:

The occurrence of two successive years of drought and short-hay crops is an event which should teach the dairy-farmer the wisdom of understocking rather than overstocking his farm, and more especially his pastures. In fact, the evil of overstocking does not end with the year. In 1870 pastures became very short before the end of the haying season, and in consequence it became necessary to feed the aftermath very early; and, the pastures not recovering, the cattle were obliged to be kept upon the meadows until late in the season; hence, perhaps, as much as from any other cause, the light hay-crop of 1871. Again, in many dairies the yield of milk became inconsiderable and unprofitable early in September, and many cheese-factories ceased working in that month. With pastures less heavily stocked a moderately remunerative yield might, in many cases, have been maintained, and the loss of the most profitable month to the butter-makers would not have been incurred. The evil effects of drought upon pastures may be mitigated by the provision of green crops to be used for soiling, or at greater, though doubtless sometimes profitable expenditure, by feeding the cows with meal; but pasture itself, the readiest and best resource of the dairyman, cannot be made or purchased at the time of need.

The annual fair of the society was held this year in Albany, and was a marked success throughout. In the cattle department, besides the usual fine show of Short-horns and Devons and a larger number of Herefords than for some years previous, there was an exhibition of Ayrshires far superior to any ever brought together on similar occasions. In this class competition extended beyond the limits of the State, and some of the best animals shown were from Canada and New England. The gem of the class was the bull Mars, shown by Mr. John L. Gibb, of Quebec. In Jerseys, there was a large entry of the finest animals, and the competition was animated and close. The entry of horses was not large, but the quality of the animals exhibited has never been surpassed. Some fine specimens of the Hambletonian and other strains of the Messenger blood attracted much attention.

During the year there were two outbreaks of fatal diseases among the cattle of the State. In July verminous bronchitis occurred among cows and calves in the neighborhood of the village of Cuba, in the county of Allegany. This fatal malady, caused by the presence of thread-like worms in the lungs and air-passages, was commonly supposed not to exist in this country; but Professor Law reports this as the third instance of its occurrence in the State of New York brought under his personal observation. In September an apparently obscure but fatal disease broke out in a dairy of cows near the city of Albany. It finally proved to be splenic apoplexy, a disease most destructive in its ravages. In the dairy referred to 16 cows died in eighteen days. The secretary says this disease is more frequent in its occurrence and

destructive in its results than all the other diseases to which the neat cattle of the State are liable.

The year 1871 completes the fortieth year of the existence of this society. It was established in 1832 by James Le Ray de Chaumont and his associates, and revived and greatly extended in its scope by the institution of its annual cattle show and fair in 1841. This new impetus was given the association through the influence and labor of such men as Messrs. Wadsworth, Beekman, Lenox, Van Rensselaer, Prentice, Rotch, Sherwood, Tucker, McIntyre, Livingston, and others. Since then it has pursued a steady onward course, from time to time enlisting in its ranks the most enthusiastic and intelligent agriculturists and friends of agriculture of the State, and maintaining a constant advance in the improvement of the great interest which it was established to promote. The society has outlived two charters, each for twenty years, and now starts out under a third, this time under a charter extending forty years.

At the annual meeting of the society, held at Albany on the 14th of February, 1872, Mr. Milo Ingalsbe was elected president, and Thomas L. Harrison corresponding secretary, for the ensuing year. During this meeting several addresses were delivered eulogistic of the life, character, and services of William Kelly, a deceased member of the board.

The treasurer's report shows a most satisfactory financial exhibit. In excess of all expenditures the society was able to start forth on its forty-first year with a balance of $29,325.04 in its treasury.

The retiring president of the association, (Mr. Richard Church,) in his valedictory address, spoke as follows of the importance of a more thorough knowledge of the composition of soils:

> Perhaps no subject requires more intelligent study than the application of manures to soils. In this the experience of one man appears to be the exact opposite of another's; and we become confused in reading different experiments that yet may be reconciled by careful investigation. Results are often diverse when conditions appear similar. An experiment is given on a dry, gravelly soil, and results stated. Some one has a field apparently similar, on which he conducts the same experiment with quite different results. Were all gravel of the same material this difference might be inexplicable; but there is a wide difference between gravel formed from limestone and that formed from quartz; so with that formed from granite, slate, sandstone, or other rocks. The same of loamy, sandy, and clay soils, which are but the disintegration or decomposition of rocks, mingled more or less with vegetable matter, and often so nearly resembling each other in appearance that nothing but analysis or experiments will detect the difference.
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> Much of the success of English husbandry is due to the application of this rule of adaptation. The English breeder suits his stock to the pastures on which they graze; hence the Short-horns are found in one district, the Devons in another, the Herefords, Ayrshires, and Jerseys each in their own; and by this system of breeding for locality, and by careful selection, there has been a constant improvement in each variety. Their application of the same rule to cultivating crops and applying manures has led to an increasing yield; while with us, from failure to study and apply this principle of adaptation, in most cases the best breeds of cattle actually deteriorate, and from the same cause the yield per acre of crops is growing gradually less instead of increasing.
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> It is a safe rule to govern the farmer when he finds any crop failing in productiveness, after proper experiments by manures and cultivation, to conclude that that crop is not adapted to his soil. In like manner, if any breed of cattle or sheep, with proper care and feeding, and proper selection in breeding, is found to deteriorate even in the smallest degree, it is safe to conclude that the breed is not adapted to the locality. On the other hand, when a farmer is constantly increasing the yield and quality of his crops, and, consequently, the productiveness of his farm, and when the animals reared are improving, it is safe for him to conclude that he is right in the selection of his crops, and in the breeds of his animals, and he should be very cautious how he is lured from this progressive course by descriptions or inspections of more profitable crops, or more admired breeds, in other localities.

At the winter exhibition of the society Mr. John G. Lewis, of Herkimer County, was awarded a premium of $20 for the best acre of

mangel-wurzels. The yield was 900 bushels. His mode of cultivation was as follows: The soil was a clay loam, and was manured with cow (barn) manure at the rate of twenty loads per acre. The land was plowed the previous fall, and the manure applied in winter, left in small heaps; spread in the spring and harrowed in; then ridged; seed sown in ridges at the rate of four pounds of seed per acre; sown the 8th and 9th of May. Crop harvested on the 21st and 23d of October, and weighed 54,000 pounds, or 900 bushels at the rate of 60 pounds per bushel. The crop was cultivated in the ordinary manner, with horse and cultivator, at a total cost of $58.50, or a fraction over 5 cents and 4 mills per bushel. The cost of manure and interest on investment is not included in this estimate.

Mr. William P. Ottley, of Ontario County, exhibited some fine samples of White and Red Mediterranean, Treadwell, Wicks, Diehl, Bald Amber, and Lancaster wheats. A full statement of his experiments, with the different varieties exhibited, accompanied by a comparison of results, is given. The experiments were conducted on quarter-acre plots. The soil was of the same character, and the manner of preparing the land and sowing the grain was in all respects similar. The concluding portion of Mr. Ottley's statement is as follows:

As all the varieties were sown on the 10th day of September, from 258 to 262 days elapsed before beginning to head. From beginning of head to blow, from four to seven days; from blow to full formation of berry, from fifteen to twenty days; from formation of berry to harvest, twenty-five to thirty days, making in all, up to harvest, about 300 days.

The above applies in this case to time and locality; but we all are aware that each locality varies according to circumstances. In regard to productiveness and profit of each variety, taking my table of weights and measures below, it shows the White Mediterranean gave ten bushels and one pound on the quarter acre; the Treadwell, nine bushels and twenty-six pounds, and so on as they show.

July 21 I threshed all the varieties; July 27 weighed the same, and obtained the following results:

Varieties.	Yield of each plot.			Yield per acre.		Weight of measured bushel.
	Lbs.	*bush.*	*lbs.*	*Bush.*	*lbs.*	*Pounds.*
Treadwell	566=	9	26	37	44	62½
Wick's	510=	8	30	34	00	62
Diehl	445=	7	25	29	40	61
Red Mediterranean	535=	8	55	35	40	62½
Bald Amber	506=	8	26	33	44	62
White Mediterranean	601=	10	01	40	04	62
Lancaster	504=	8	24	33	30	62

The proceedings of the second annual meeting of the Practical Fish-Culturists' Association are given in full, in this volume of transactions. The meeting was held at Albany, commencing February 7, 1872. It was well attended by representatives from almost every section of the country. At the first session permanent officers for the current year were elected as follows: President, W. Clift; Treasurer, B. F. Bowles; Secretary, Livingston Stone; executive committee, Seth Green, chairman, J. D. Bridgeman and A. C. Rupe.

A committee was appointed to memorialize Congress and ask an appropriation from the Government for the erection of two or more fish-hatching establishments; also to make arrangements with such foreign countries as are engaged in fish-culture for a mutual exchange of food-fishes. It was also resolved to recommend to the legislatures of the various States the importance of the enactment of stringent laws for the

protection of pioneer fish-culturists in their efforts to restock the rivers and lakes of the country.

The secretary, in referring to a trout sent to Mr. Frank Buckland, from Dunlop House, presented a certificate, signed by Messrs. Stevenson and Robertson, in which they state that they have lived about Dunlop House for twenty years, and to the best of their belief the trout sent to Mr. Buckland is one that was put in the well by Thomas Young, twenty-four years ago, viz., 1848. This is regarded as the oldest well-authenticated instance of trout-life on record.

A description of Castalia Springs, located near Sandusky, Ohio, and owned by Mr. J. Hoyt, is given. These springs promise to be one of the great natural water-supplies of the country for fish-farming—like the Caledonia Springs in New York, or the Ingham Springs in Pennsylvania. The Ingham Springs, it is estimated, run 3,000 gallons per minute, and the Caledonia Springs as many gallons per second. Dr. Sterling, of Cleveland, writes that the flow of water at the Castalia Springs, the temperature and the geological formations, are nearly the same as at Caledonia.

A condensed statement of some successful experiments in the breeding of salmon in the waters of Maine is given in the report of the secretary. The experiments were conducted by Commissioner Atkins, whose plan of operations was as follows:

To buy live salmon of the fishermen in the vicinity of Bucksport, transport them to some convenient place where they could be confined within a small space in fresh water, and keep them until the spawning-season, when their eggs would be taken. All the eggs were to be developed on the spot sufficiently to insure their safe removal, and a portion of those belonging to Maine to be hatched out and turned into those waters to assist in increasing the number of salmon in the Penobscot, which would thereby become better able to afford us parent salmon in the future. * * * * The eggs cost the subscribers to the fund $18 per thousand. The price demanded and received at the Canadian governmental establishment at Newcastle, when I purchased salmon-eggs of them in 1870, was $40 gold, the eggs of a single fish costing several hundred dollars. The prevailing price of parties operating in New Brunswick has been $20 per thousand for eggs warranted to be fecundated. When the extraordinary mortality among the salmon we intend to use as breeders is considered, it is remarkable that the eggs taken at Orland did not cost more. I have no doubt that, with the advantage of this year's experience, they can be obtained hereafter at an expense not exceeding $8 per thousand. The experiment has decided in the affirmative the following questions, viz: 1. Whether salmon can be kept in confinement in a small inclosure from June to November. 2. Whether they will, under such conditions, develop their spawn and milt to perfect maturity. It has also determined the conditions of safety in transportation, and to a sufficient extent for practical purposes the conditions of safety in keeping them through the summer, and finally the best mode of manipulation to secure complete fecundation.

As to the conditions of keeping salmon in safety through the summer, my conclusions may be briefly stated thus: Salmon will live in perfect health in common river, pond, or brook water, provided that there be sufficient change to prevent stagnation; that the depth be not less than four feet, and that they be not too much crowded; that the bottom be not newly submerged; that the water be not too transparent; and, in the case of a brook, that there be not a large percentage of water from springs in the immediate vicinity. I have no doubt that some of the salmon that died in the pond died from injuries received in capture and transportation.

According to the report of the fish-commissioners of California the area of inland bays and fresh-water lakes in that State, adapted to fish-culture, exceeds six hundred and fifty square miles. In addition, nearly one hundred streams from the coast-range of the western slope empty into the Pacific, and several hundred water-courses unite in the Sacramento and San Joaquin Rivers. The whole forms a most remarkable water-surface, and, when properly stocked with fish, will be a source of revenue to the State ranking next to its agricultural and mineral resources.

In the course of a valuable paper on shad-culture, read by Mr. William Clift, the following passages occur:

We have learned almost all that we know of the natural history of this fish since its artificial propagation was undertaken at Hadley Falls in 1867. Many of the erroneous opinions held by old fishermen upon the rivers have been dissipated, and certain facts are well established, though much yet remains to be learned. It is now known that the life of the shad, instead of being limited to one year, extends to five, and probably to ten or twelve years; that the "chicken-shad," as they are called among the pound-fishermen, instead of being a distinct species are the yearlings of the *præstabilis;* that the males are ripe at a year old, and come into the rivers, led by the sexual instinct, while the females are not fecund until the second year, when they make their appearance as small-sized shad; that they reach a merchantable size, or a weight of about four pounds, in three years; that at this age they have spawn in the ovaries of three distinct sizes plainly apparent, and the microscope reveals others still smaller in reserve; that only the larger eggs, or about one-third of those visible, are spawned, while those that remain are the crops for the two succeeding years; that the spawn of a full-grown shad, the ovaries weighing thirteen ounces, is about 70,000 in one season. * * * * I had the pleasure of witnessing the process of taking the spawn and hatching it, as it was performed by Mr. Smith at Hadley Falls the past season. The seines are drawn only at night, and there are three hauls made between 8 and 12 o'clock, at intervals of almost an hour, because it is found that no ripe shad are taken by day. From one to two hundred fish were taken at each haul, the female fish increasing with the lateness of the hour. As soon as the shad were hauled to the shore they were taken in large baskets to the pan, where they were stripped. Two men held the fish over the pan while Mr. Smith stripped the most of them in less than a minute each. Some of the males were not ripe and were not stripped at all. As fast as they were finished they were thrown into the pan and sold to hucksters whose wagons were waiting for them. The fishing had ceased at all the places below, and the spawners were very plenty. The milt was brought into contact with the spawn by gentle stirring with the hand, and the contact of the two was so instantaneous, after the emission from the parent fish, that few eggs could escape impregnation. The eggs swell immediately after impregnation from 9.100 to 13.100 of an inch in diameter, nearly doubling their bulk in the vessel. Another very curious fact is the sudden sinking of the temperature of the water about 10° in which the eggs are suspended. After the eggs have remained a half hour or more in the pans they are carefully washed and placed in the hatching-boxes, which are suspended in long rows from a boom fastened across the current of the river.

Little has been accomplished in the way of the artificial propagation of salmon. Of the first fry introduced in the Merrimack River, New Hampshire, no returns have been realized. The salmon have been seen and caught going to sea, but none have returned. Salmon were caught, however, in the spring of 1871, at Holyoke, and at Saybrook, the mouth of the Connecticut River, showing that the fry introduced in the river in 1869 were attempting to return. Those in the Merrimack have never returned, owing to the inefficient fish-ways at Lawrence and at Lowell.

In a paper read before the meeting on the subject of land-locked salmon, Mr. B. F. Bowles states that in external appearance the land-locked salmon closely resembles the sea-salmon, except in size. In anatomical structure they are said to be identical. The eggs are the same size, and the young fry are almost precisely like those of migrating salmon. Between the fry of a few months old of the two species there is scarcely any perceptible difference. It has the jet black spots of the true salmon on its gill-covers. It also has the recurved conical tusk on the lower jaw, peculiar to the true salmon. It ascends the streams at night, and its period of spawning is short, like the true salmon. The color of the flesh is the delicate pink of the salmon, perhaps a few shades lighter, but it has not the white curds between the muscles, as in sea-salmon. The weight of land-locked salmon varies with the different localities where they are found, and, what is somewhat singular, the largest fish are sometimes met with in the smallest lakes. Thus the Sebago salmon now average in weight five pounds to the males and three to the females, but larger ones are sometimes taken. The

largest on record is seventeen and a half pounds. The fish from Reed's Lake weigh from ten to twelve pounds, while those from the Schoodic Lakes, which are much the larger range of waters, average one and one-half pounds, and an eleven-pound Schoodic salmon is the largest on record.

Mr. Livingston Stone read an elaborate paper on the subject of trout-culture. While speaking of the treatment of young fry, he thus alludes to the causes of loss among them:

There is no inherent cause of death in the young fry which cannot be removed. Some will die, say 5 per cent., though it ought to be less than this, of weak constitutions. They are born into the world so weakly-constituted that they cannot stand the wear and tear of life, and must die. I admit, therefore, that there may, perhaps, be 5 per cent. of these unavoidable deaths; but that the rest come into being already doomed to premature death, or that young trout have any mysterious or peculiar inherent cause of death in them, any more than young calves, or pigs, or chickens, I do not believe. In the present state of information in the art, young trout-fry may be more liable to accidents than other young domesticated creatures, and it may be more difficult to guard against their diseases; but this is another thing. Careless breeding may, and careless hatching certainly will, produce a progeny of young trout of which 100 per cent. will die; but this is also another thing.

Careful breeding and hatching will produce trout which are just as likely to live, in my opinion, as the same number of lambs or chickens; and if the young fry die it is not because of any mysterious disease, or innate cause peculiar to them because they are trout; but it is because they were killed by external causes, just as lambs or chickens are killed by storms, or by parasites, or from starvation or poison. It is true that they are killed from ignorance of their wants, and not from willful neglect, but it is the same thing abstractly; the cause of death is external and removable, and not innate or necessary. Their wants are peculiar, of course, and more occult and intangible than those of pigs and colts, and to a beginner it will sometimes seem as if they died when nothing ailed them. But if they were as large as pigs and colts, and could be studied as easily, I do not think their wants would be found to be any more mysterious or peculiar; and if the causes of disease could be magnified so as to be observed and studied clearly, I think that no more trout would die when nothing was the matter with them.

I am furthermore convinced that study and experience will eventually clear up this subject, notwithstanding the difficulties which surround it, and that at some time it will be known how to raise trout, and make them live, as well as it is known how to raise chickens and turkeys.

The writer then states that since he has used charcoal troughs and tanks altogether, deaths among the young trout have been, among some lots, rare occurrences, and in general have been no more frequent, over the 5 per cent. weak ones, than among the yearlings and breeders. In one charcoal trough in particular, containing over five thousand fry, there was, in the season of 1870, less than 1½ per cent. of deaths, from all causes, in three months. It was the same in the year 1871. In one box of a thousand he did not take out ten dead ones in three months. This is attributable, in a great measure, to the use of charcoal in hatching; but it confirms the theory that the causes of death can be removed.

A brief article on the subject of rearing minks was read before the association. The business can be made quite profitable, as it is a well-known fact that they breed rapidly. All that is needed is a constant-flowing spring, with a small plot of ground. To prepare the yard for occupancy necessitates but a small outlay of money, and the subsequent expense of raising is nominal. At the age of from five to seven months the minks are worth from five to eight dollars each for their skins. The following account of Mr. Henry Ressigue's experience in the rearing of minks in Oneida County, New York, is quoted:

He commenced the raising of minks in 1867, having caught a female mink with young. Since that time he has raised over one hundred. He sells them for breeding at $30 a pair, including box, and they can be forwarded by express to any part of the country. The pen in which he keeps them consists of an open yard, 60 feet square, surrounded by a common board fence, 6 feet high, the cap-board projecting

inward 16 inches to prevent his stock from climbing out. The following is the manner of preparing a yard for a single pair, the size to be 12 by 14 feet: Having marked off the ground to be occupied, a trench 8 inches deep and 15 inches wide is dug around the plot. Flat boards are laid on the bottom of the trench so as to entirely cover it, and posts are set outside the trench. The first board of the fence is nailed base-board style on the inner side of the posts, with the edge on the flat board at the bottom of the trench. The trench may now be filled with dirt and the fence completed, boarding up and down. The cap-board should be thoroughly stayed outside and top. More yard-room can be added as needed. To prevent the mink from escaping by the stream, where it enters or leaves the yard, place a goodly quantity of stones about the size of hen and goose eggs at the inlet and outlet of the stream.

Mr. Ressigue states that he has not expended $25 in the purchase of food in five years. Any refuse of fresh meat is just what they want, and is equally as good as that which would cost more. Fresh fish is also a good food, and seems to be well relished by them. The male and female are left together from the 1st to the 20th of March, when they are separated by placing the male in the adjoining yard. The young should be allowed to remain with the mother. The young should be fed bread and milk occasionally as a relief to the mother. Minks require hardly any attention beyond that of food, as they seem to have no enemies from which they cannot protect themselves, are entirely free from disease, and not liable to accident.

The New York State Dairymen's Association and Board of Trade assembled at their trade-rooms at Little Falls on July 10, 1871, for the purpose of formally opening the same. The meeting was well attended, and much interest was manifested in its proceedings. Mr. X. A. Willard, president of the association, delivered the opening address. In alluding to the vast interests involved in the subject upon which he had been called to address those present, he stated that American dairying represents a capital of more than $1,000,000,000. The cheese-product last year sold for $30,000,000, and the butter-product for at least $200,000,000. In 1864 the butter-product of New York alone was nearly 85,000,000 pounds, and the cheese 72,000,000 pounds. The value of these products, at a very moderate estimate, was more than $50,000,000. Of the dairy-interests of Herkimer County he said:

Herkimer County has a record and history in connection with the dairy of some prominence, to say the least. It was upon these black-slate hills that American dairying first took its rise. It was here the problem was solved that the dairy could be conducted successfully as a specialty, and that as a specialty it could cope in its pecuniary results with any of the other agricultural interests of the State. Herkimer is the oldest dairying district in America. I knew the man in his old age who first began dairying in Herkimer. He is said to have come into the county on foot from New England, nearly eighty years ago. He was rich in health and strength. He is said to have had but eight shillings in his pocket, an ax upon his shoulder, and two strong arms to swing it. Nearly the whole country was then a dense forest. * * * * * If you cut Herkimer County in two, and separate the northern half as a wilderness by reason of its forests, you will find the area of cultivated land in Herkimer to be the smallest of any county in the State, and yet with less land and a smaller number of cows, it produces double the dairy-products of any county in the State. I know of no region, whether in this country or in Europe, where the average make of cheese per cow has been so large. The largest quantity of cheese recorded, amounting to nearly 900 pounds per cow, was made in Herkimer by a well-known Herkimer County dairyman.

As to the importance of this association, and the necessity for its organization, Mr. Willard said:

It has been abundantly proved, whenever the experiment has been tried, that an organized system of marketing is not only a benefit to the producer but to the produce-dealer. When goods are scattered over the country it requires immense labor on the part of dealers to hunt up and get supplies together. It is also quite expensive, not only taking time, which is valuable, but necessitating an outlay for horse-hire and other traveling expenses, which, in the aggregate, during a season, amounts to a very large sum, all of which the dealer must either lose from his legitimate profits, or take out of the farmers' earnings by purchasing at so much below the actual market value of the article for sale. Suppose a farmer has five tubs of butter, or a few hundred pounds of cheese, ready for market. The dealer makes a journey to the premises and buys the goods. His time is very much more valuable than that of the farmer,

and the actual expense of the journey (say $10, and perhaps more,) must be met somewhere. Neither the farmer nor the dealer can afford to lose this sum. It is a waste of time and a useless expenditure of money, resulting from a wrong system of marketing; for if the producer and dealer agree to meet on a certain day at some convenient market-point, a large amount of goods can be examined in a brief time and at minimum expense. But this is not the only advantage. There is a constant change going on in the great markets of the world; the price may be up this week and down the next. When goods are scattered over the country in separate lots it takes too much time to gather them together, and hence the dealer must run larger risks or must make a liberal margin on his prices to cover any prospective loss on account of the delay in getting to the city to meet present demands and present prices. If the dealer can meet the producer at the railroad-depot, and purchase his goods and ship them at once, he knows to a certainty when they will arrive at their destination, and thus he reduces his risks. And it is very important to the farmer that these risks be reduced to the lowest possible point, for heavy losses on the part of the dealer always re-act upon the producer, making dull markets and depression in business. It is right and proper that dealers be paid liberally for their services, for the risk of their capital, and for their skill in handling produce, and what we seek by a central market is not to deprive them of their just compensation, but to cut off useless expense, and make business more safe and profitable to both parties. Again, a central market stimulates to better production and more permanent improvement. There is many a farmer and factory-man who has no adequate idea of the relative quality of his goods until they are set side by side with those that are better, and where they can be fully tested and compared. At a central market you meet with numerous experts, and the judgment of different persons gives more satisfaction, and gives greater weight than that of one person, whose opinion is often suspected of being warped or biased, perhaps for private ends. Then at a regular central market there is always a community of interests, a spread of intelligence, not only as to market values but as to production and manufacture, which are of very great importance to the producer's interest.

Other short addresses were delivered, after which the association adjourned to the 1st of January, 1872, the time agreed upon for the first annual meeting of the association. The attendance at this meeting was large, and included some of the most prominent and successful dairymen in the State. Mr. Willard, in his opening address, stated that the exports of cheese, during the past year, were the largest ever made. According to the official returns of the custom-house, our exports from January 1 to December 24, 1871, amounted to 67,530,000 pounds, and for the same time in 1870, 61,451,500 pounds, showing an increase in one year of 6,078,500 pounds. In 1870 our exports of butter amounted only to 1,394,200 pounds; 1871, 8,519,700 pounds, an increase of 6,125,505 pounds.

The speaker alluded to the low price of cheese during the past year, and said that the decline was not caused by an excessive supply, but was the result of an inefficient system of marketing. He stated that there was scarcely a factory within his knowledge provided with room sufficient to keep the hot-weather cheese. He said:

The factories push forward immense quantities of cheese in July and August, not only from the fear that it will lose flavor at the factory, but because there is no room to hold it. The local dealer who buys is in a hurry to be rid of it for fear of losses in hot weather. The shipper is also afraid of it for the same reason, and every one who handles cheese in hot weather is in hot haste to shift responsibility and risk upon some other shoulders than his own. I cannot see how it is possible to sustain prices under such a condition of things. It is a forced sale from beginning to end, and the law of forced sales is that real values cannot be realized. The remedy, it is obvious, lies in additional curing-houses at the factory, so constructed that cheese may be held from time to time as desired.

It is believed by many that the dairymen of the East are to get relief by the abandonment of dairying in the West, thereby reducing the general make of cheese. I do not think we can look for any permanent benefit in this direction. The business will be developed from year to year in new localities, where lands are adapted to the dairy. You cannot convince the West that more money is to be made in pork or grain-raising than in dairying, even at the present prices, because the facts are against any such assumption. The cost of transportation eats out the profit on grain-raising at the West. The cheese-makers of Illinois are altogether better off this year than the grain-raisers of that State, and so of Wisconsin and other States. We are not overproducing in dairy goods; that is not the matter; but we lack enterprise in opening up the home

market, and in supplying the kinds and qualities of cheese desired by our people. And then, again, we persist in that miserable stupidity of forcing forward our goods when there is most risk in handling, and when they cannot be taken except at a heavy margin to cover heavy losses. The fact has become notorious that America furnishes no old cheese. There is a demand for good old cheese at high prices, but it cannot be had at any price.

Mr. Leander Wetherell read a very elaborate essay on the subject of "Dairy stock and forage therefor." He speaks very highly of the Holstein or, as they are called by some, "Dutch" breed of cattle, and says they are coming into high favor among dairymen in the United States for cheese making. He cites as an illustration of their good qualities as milkers the herd of Mr. G. S. Miller, of Peterborough, Madison County. In 1870 these cows gave nearly seven and three-fourth times their own weight in milk; in 1871, about seven and one-fifth times, showing an average in two years of about seven and one-half times. On the subject of breeding for the dairy or the shambles Mr. Wetherell gives the following points for the bull:

Special regard should always be had to the outline structure or good points of the bull; he should have a small, well-set head, rounded ribs, straight legs, small bones, and sound internal organs. The following are deemed the best points in a Shorthorn bull: a short and moderately small head, with tapering muzzle and broad forehead, furnished with short, waxy, curved, graceful looking horns; bright yet mild, large eyes, placed in prominent orbits; dilated nostrils and flesh-colored nose, and long, thin ears. The neck should be broad, deep, and muscular, sloping in a graceful line from the shoulders to the head. The chest should be wide, deep, and projecting, but level in front. The shoulders should be oblique, the blades well set in toward the ribs. The fore legs should be short, muscular above the knee, and slender below it; the hind legs should be slender to the hock, and thence increase in thickness to the buttocks, which should be well developed. The carcass should be well rounded on each side, but level on the back and the belly. There should be no hollows between the shoulders and the ribs, and the line from the highest part of the shoulder to the insertion of the tail should be a perfect level. The flank should be full, the loins broad, and the tail finely formed and slender. The skin is a prime point; it must be covered with hair with a roan or other fashionable color, and communicate to the touch of the hand of the experienced feeler a peculiar sensation which it is impossible to describe, yet a point that seldom if ever misleads the experienced "handler."

In the course of a paper read by Mr. L. D. Arnold on the subject of "The future of dairy husbandry," the following passages occur:

At the constant rate of increase of population in the United States, the year 1900 will find us with 100,000,000 inhabitants. If we continue to consume cheese at no greater rate than at present, it will require two and a half times the quantity we now consume, or 450,000,000 pounds, to supply the annual home consumption of that day. The shipping demand must also increase. Nothing but a war with England can prevent it. The English are a cheese-eating people. They are now using ten pounds per head per annum, or more than twice as much as we do. Nor is that rate of consumption likely to be abated. The strong necessity felt by the laboring classes, and especially by the English people, for animal food, must be supplied in some way; and it can be done in no way so well or so cheaply as by the use of cheese. As I showed upon a former occasion, cheese contains more than twice as much nutrition, pound for pound, as meat; while more pounds of cheese than meat can be produced from a given quantity of food. Cheese, therefore, will very naturally grow in favor with the masses, as being by far the cheapest and best animal food for laboring people. Besides this, the habits of the English nation are very stable, and are not likely to be very easily changed. We may safely assume, then, that they will continue to use cheese no less freely than at present. But the population of England is increasing, while her capacity for cheese-producing is not. And so, too, with Germany, which now supplies England with the great bulk that England fails to supply for herself. There is no other country in Europe making cheese to export in any considerable quantity, and hence we may fairly anticipate that the supply of the increasing wants of England will be drawn from the United States. * * * The million a year added to the English population will be very likely to call for ten million pounds more of cheese from us, so long as we can supply them with a more desirable article than they can obtain elsewhere, for the same money. If we continue to consume cheese at the same rate we do at present, ($4\frac{1}{2}$ pounds per head per annum,) the annual increase in the United States will call for an increase of six million pounds a year to supply the increasing home consumption. With a steady improvement

in the average quality of cheese, the rate of consumption will, doubtless, also improve; so that, with the increased export demand, the year 1900 will call upon us for an amount of cheese not much less than a billion pounds. It must at any rate require a larger expansion of the cheese-dairying interests of the country to meet the wants of that year. Then there is our butter-interest, larger still. We export but little butter, but we consume about three and a half times as much as we do of cheese. Our consumption varies from 13 to 17 pounds per head per annum. We are now using 16 pounds a head. With an average of 15 pounds to the inhabitant, the hundred millions who are to occupy our places in 1900 will require a billion and a half pounds for their yearly use. * * * * I have often heard dairymen predict a high reward for dairy-products in the future, especially for cheese, because the demand was outrunning the limited capacity of the dairy-districts of the country; while others believe its capacity large enough for any productive demand. The State of New York is probably more exclusively devoted to dairying than any other State in the Union, and yet by many of her own citizens a small share of the State only is accredited as good dairy-land.

In an essay read by Mr. Hiram Walker, on the subject of the dairying interests of Oswego County, the writer states that it is but nine years since the first cheese-factory was erected in that county, while to-day there are fifty factories in operation, receiving the milk of from 200 to 800 cows each. In the town of Mexico there are five factories which work the milk of 2,200 cows. The past season one of these factories (Davis Union) made over 200,000 pounds of cheese. The number of cows in the county has increased from 10,000 thirty years ago to over 30,000 at present. He estimates that each cow represents, in herself, in land for keeping, in factories, and in all implements and fixtures for marketing butter and cheese, a capital of $300. This shows a capital of $9,000,000 invested in dairy-agriculture in the county. The average make of cheese per cow does not exceed 350 pounds in a season. Some dairies make over 50 pounds of butter per cow, beside cheese. At the factories 200 pounds of butter per cow is a good average for butter-dairies.

The report contains the papers read and the various discussions which occurred at the monthly meetings of the Central New York Farmers' Club. Many subjects of great interest to the farmer, dairyman, and horticulturist were ably discussed at these meetings, but the limited space allowed for these reviews forbids a further notice of the work.

SOUTH CAROLINA.

The proceedings of the annual convention of the South Carolina Agricultural and Mechanical Society for the year 1872 are published in a small pamphlet of about 60 or 70 pages. The pamphlet contains a list of the premiums awarded at the last annual fair, statements relating to the financial condition of the association, address of the president, an essay on "Plantation economy," by Mr. D. Wyatt Aiken, secretary of the society, mode of cultivating the crops on which premiums were awarded, and other facts of interest to the agriculturists of this State.

The treasurer's report shows that the income from the last fair was $5,578.35. Of this amount $4,410.91 was paid for expenses of the fair, and $800.65 for improvements on the fair-grounds. Thus far the income of the society has been derived exclusively from its fairs, and it is to be regretted that this income has not been sufficient to keep it free from debt. In his address delivered before the society, President Hagood urges the propriety of applying to the legislature for aid. He says that South Carolina is probably more exclusively agricultural in the pursuits of her people than any other State in the Union, and is among the few—perhaps the only one—in which the State Agricultural Society

receives no appropriation from the public treasury. Mr. Hagood further says:

It were well, also, to consider whether our society, as at present conducted, is fulfilling the measure of its usefulness. Our annual meeting is merely supplemental to the holding of a fair, useful in itself as an exposition of the industries of the State, and valuable as an occasion of the social re-union of the people. The opportunity of this general gathering has been seized upon by other organizations—meritorious it is true—to have their meetings; and, after a fatiguing day at the fair-grounds, members are required to meet the society at night, and matters are hurried through to give an opportunity of discharging the obligations elsewhere required. The consequence is that the merest requirements of actual business are met, and though most valuable agricultural papers are annually published in our proceedings, the majority of them have been adopted without having been read before the society; and we have never yet had such a thing as a plain, practical, farmer-like discussion of agricultural topics in our hall.

It occurs to me that this difficulty may be met by confining ourselves at the winter meeting to business relating to the fair, and the discharge of the necessary routine business of the society, and by having a spring and summer meeting at which the chief object will be the discussion of agricultural topics. A carefully prepared syllabus of agricultural and mechanical subjects for observation, investigation, and experiment should be adopted by the society, and regularly gone through with. The subjects to be considered at the next meeting should be duly announced by circular to each member, and to the county societies, from which delegations should be invited. Individuals should be appointed to open each discussion, and a stenographer to report the debate, all of which, in a compendious form, should be published in our transactions. Thus a mass of most valuable agricultural information would be disseminated, and an increased interest taken in the society by its members and others would soon be manifested.

Mr. Robert Ellison, jr., was awarded the premium, at the State fair, for the largest yield of corn on an area of not less than ten acres. The field entered for the premium contained twenty acres, and yielded 1,030 bushels, making an average of 54¼ bushels per acre. One acre returned 69½ bushels. Mr. Ellison makes the following statement in regard to the quality of the land and his mode of cultivation:

The lands were wet, sour, and crawfishy. I had them thoroughly ditched and underdrained last fall and winter. They were broken up with three-inch bull-tongues three times during the winter and early spring. The first of March they were bedded with a very small half-shovel plow, and immediately before planting, which was about the first of April, they were rebedded with the same kind of plow, the corn dropped in the last furrow, and manured with 20 or 25 bushels cotton-seed, composted with barnyard manure, and covered with the hoe. I secured a fine stand in about ten days. As soon as the corn was large enough I ran around it with bull-tongue, and put two furrows in the middle with shovel-plow, following with the hoe, leaving it thinned out to one or two stalks, and in fine growing condition. In two weeks after, sided it with a large bull-tongue; the corn remained in that condition for ten days, when I threw out the middles with a shovel-plow, three furrows to the row, which was all the work done, except a light hoeing.

In his essay on "Plantation economy," Mr. D. Wyatt Aiken says:

The cultivatable land of South Carolina is capable of sustaining four times its present population. Hence there must be a vast quantity of it waste or unprofitably utilized, simply growing up in pine thickets and producing nothing to defray the annual taxes imposed upon them. Few acres in the State are so sterile that they will not cover their own nakedness with vegetable matter during the summer. This growth can be and should be turned to account by being consumed by sheep upon the spot where it grows. One million Merino sheep might be imported into South Carolina on the first of next May and subsisted till the first of the following November without further cost than penning them every night as security against dogs. Almost every native grass or weed that grows in the State is fattening food for sheep, and being closely nipped by these ramblers is carried nightly to the hurdling-pens and before morning there distributed, with wonderful accuracy, as a concentrated fertilizer over the land. Every hundred sheep thus managed during the year will so thoroughly enrich the most barren two-acre lot that it will grow, the following season, barley or turnips enough to carry the same hundred sheep through the succeeding winter; and if this lot be then seeded in grass it will yield two tons of hay to the acre, or if planted in cotton will produce more than a bale to the acre, with average seasons and proper culture. * * * * * Almost anywhere in South Carolina barley will produce,

upon sheep-hurdled lots, from 25 to 50 bushels per acre; rye will produce on any upland as many bushels as corn; wheat should be grown only to prevent buying flour; red oats will produce two bushels with more certainty and less expense than corn will one; and if one bushel of corn will feed a working mule four days, two bushels of red oats will feed him five days, keep him in better health, make him more sprightly, and tend to prolong his life, whereas corn as a constant food has an opposite tendency. These red oats have never yet taken the rust in South Carolina, and have never failed to remunerate the farmer if sown early enough in the fall. If sown in August they will supply winter pasturage for sheep without detriment to the crop, and greatly to the benefit of the flock. To economize labor they should be sown on cotton-land previously to plowing the cotton the last time.

RHODE ISLAND.

The transactions of the Rhode Island Society for the Encouragement of Domestic Industry for the year 1872 are briefly given in a pamphlet of 172 pages. The first fair and exhibition of this society held within the past five years occurred at Narragansett Park, Cranston, R. I., on the 17th, 18th, and 19th of September, 1872. This park is the private property of Messrs. A. & W. Sprague, who tendered its free use to the society, together with all its buildings and other accommodations. A liberal premium list was offered, but owing to unfavorable weather the receipts of the society were insufficient to cover the expenses of the exhibition.

The report of the secretary for the last year gave the whole number of members of the society as 1,296. Twenty-one members died and eighty accessions have been made since the last annual meeting, making the total number of members 1,328.

The exhibition of live stock at the fair was very fine, and gave evidence of rapid progress in the improvement of breeds. The committee pronounce it a perfect success—a great credit both to the State and the society.

The secretary gives a list of patents granted to citizens of Rhode Island during the year 1872. From this list it appears that the inventors of the State have obtained 176 patents against 155 granted them during the year 1871.

Hon. William Sprague, president of the society, in the course of an address delivered on the opening day of the exhibition, thus speaks of the dense and rapidly increasing population of the State:

We have a denser population than any of our sister New England States, Massachusetts included. In 1865 our population was 166.9 persons to the square mile of our territory. New Hampshire had only 35.1, Vermont 34.8, Maine 20.9, Connecticut less than 100, and Massachusetts 162.4. Rhode Island has the greatest number of persons to the square mile of territory of any State in the Union; also of many of the oldest countries of Europe. We have in an area of a little over one thousand square miles of territory more than two hundred centers of population—cities, populous towns, and villages. By a comparison with any former period the point I am seeking to demonstrate becomes clear. In nearly seventy years after the settlement of Providence only nine towns were formed, these chiefly agricultural in their character, their citizens generally dividing their labors into the tilling of the soil and the pursuit of a competence from the sea. In 1800 the population of the State was less than 70,000; in 1810 it was 77,000; 1820, 83,000; 1830, 97,000; 1840, 108,000; 1850, 147,500; 1860, 174,620; in 1865, 185,000; and 1870, 217,353. This marked increase in population is one of the best evidences of industry, thrift, and prosperity.

On the subject of agricultural productions, and the rapidly-increasing manufacturing interests of the State, Senator Sprague said:

In agricultural statistics we also find that our State is following the law of success. Of our nearly seven hundred farms few are on the retrograde, the large majority increasing in value because increasing their power of production. The farms of the State cannot be valued at much less than $30,000,000, including their buildings;

$3,000,000 will not purchase the stock raised or kept upon them, nor $1,000,000 the implements of husbandry employed. The annual production cannot be less than from $8,000,000 to $10,000,000, a sum-total for such territory hardly comprehended by our citizens.

In manufactures, the great industry of our State, and in which a large portion of its wealth is invested, we have made a rapid progress. I am sorry that it has not been convenient for me to collate from the census-returns of 1870 such data as would illustrate fully this growth in the staple industry of the State. In 1860 the capital stock invested was $24,500,000, increased in 1865 by $8,500,000. The value of raw materials used in 1860 was $20,000,000, and in 1865 $64,000,000, while the value of the products for the year 1860 was $41,000,000, and in 1865 $103,000,000.

WISCONSIN.

The ninth annual report of the Wisconsin State Agricultural Society, embracing the transactions of the association from January 1, 1872, to April 1, 1873, contains many valuable articles on the progress of agriculture in the Western States. These transactions are contained in a well-printed volume of 500 pages, arranged and printed under the careful supervision of the new secretary of the association, Mr. W. W. Field. In his introductory report the secretary states that agriculture has never been in a more healthy and flourishing condition in the State than at the present time. He attributes this fact to the increased crops, better prices for the products of the farm, and more direct paying results of the labor of the farmer in all the varied branches of his important profession. As indicating a most promising outlook for the future, Mr. Field says that the farmers all over the State are asking what they shall do to renovate and increase the fertility of their soils and the quantity and quality of their crops; how they may raise more and better stock; how they can better their market facilities, and generally improve their social, intellectual, and financial condition. They are beginning to appreciate the stubborn fact that this is a time of mental strength and vigor, and that no business or profession can compete with its neighboring calling or pursuit unless thoughtfully and intelligently directed. They appreciate the scientific and experimental investigations which are now being made by availing themselves of their benefits and teachings, and are beginning to understand that there must not only be industry, economy, and perseverance, backed by muscle, in conducting farming operations, but that there must be an application of common sense and chemistry, thought and brain-force to govern and direct. It is believed that much of the earnest effort now going forward, and the great desire pervading the farming community for increased knowledge on all subjects relating to advanced systems of agriculture, is due mainly to incentives given by agricultural societies, farmers' clubs, patrons of husbandry, and other industrial associations, which bring the people into closer communion and a more frequent interchange of views, experiments, and ideas.

The year was a very favorable one for agricultural pursuits, and the results more satisfactory than usual. The acreage of wheat was somewhat larger than the preceding year, and the yield per acre greatly in excess of the years 1870 and 1871. This fact is attributable to deep tillage and the improved condition of the soil by the favorable winter and spring, the ground freezing but slightly and the frost having almost entirely disappeared before the snow began to melt, thus allowing the water, rich in ammonia, to filter slowly into the soil. The quality of the wheat was also superior to former crops.

The corn-crop was excellent, and about 8 per cent. greater than in 1870. A slightly increased yield of oats is reported, which was also of a superior quality. There were average crops of barley and rye, the

first being very poor in quality and the latter about an average. Notwithstanding the potato-crop was seriously injured by the Colorado beetle, it was an average both in quantity and quality.

Cranberry culture is rapidly increasing in the State. The crop produced this season seems to have been satisfactory as to both the quality and price of the fruit, the ruling figures being from $12 to $15 per barrel. Companies are being rapidly formed for the raising of this fruit upon an extensive scale, and private parties are looking up marshes with a view of entering this field of labor for the purpose of competing for the enormous profits which are being realized by cultivators who have put their cranberry lands under proper drainage and tillage. This interest is already a source of immense income to the State.

The apple-crop was very light, not half enough for home consumption. The failure is partially attributable to tender varieties which cannot stand the severe cold of this latitude. Hardier varieties, however, are being planted, and will soon take the place of the older orchards, when an abundance of this fruit is confidently expected.

The grape-crop was enormous and of superior quality. A home-market was found for most of it at from 5 to 7 cents per pound, though in many places the supply was in excess of the demand, and in such localities they were manufactured into wine of an excellent quality and fine flavor.

The secretary urges the importance, as an economical measure, of the immediate planting of live fences. He gives the first cost of the perishable fences of the State at $40,000,000, reckoning the cost at 85 cents per rod. Basing the assertion upon long experience and observation, he says that these fences must be renewed every twelve years, causing in in the course of a half century to the people of the State an expense of $160,000,000. He is of the opinion that one-half or three-fourths of this sum can be saved by the immediate planting and rearing of hedge fences. The yellow-willow, white or soft maple, box-elder or ash-leafed maple, Lombardy poplar, cottonwood, and acacia or honey-locust, are all recommended as suitable for live fences. They are all hardy, and will thrive vigorously in any part of the State.

An agricultural convention, largely attended by farmers, fruit-growers, and scientific gentlemen of the State, was held at Madison during five days in February, 1873. Many subjects of vital importance to the productive industries of the State were brought before this meeting, and were ably discussed by experienced farmers and others who took part in the proceedings of the convention. The secretary explained the object of the meeting to be a general interchange of ideas—a social and familiar talk upon agriculture and other subjects which have either a direct or remote bearing upon this great and important interest. The addresses and the essays presented at this meeting constitute the largest portion of the published transactions of the society. Mr. William B. Taylor read a very interesting paper on the importance of agricultural societies and the advantages to be derived from industrial education and co-operation among farmers, from which the following passage is taken:

> One of the chief difficulties thus far has been, that farming is wholly individualized. This accounts in great part for its prostration at the feet of every interest that is organized and cohesive. All great human achievements are the results of united action. Our whole social system is union, from the country log-rolling to the confederacy of States. Farmers cannot afford to ignore the rest of the world. We are sadly behind, and whatever may be the cause, a closer union can do much towards removing it. There is a want of organized, intelligent, associated effort. If the farmers of this country were properly united, if a close bond of union were established, from the dis-

trict club or grange, up through town, county, State, and national organizations, so that sure and reliable information could be secured and promptly distributed, untold advantages and important results would follow. It is too late to reopen the question of educating the farming community for its own sake, as well as for the sake of all other classes. Agriculture supplies the principal material and support of all other forms of labor, while it renews and restores their waste by an unfailing supply of fresh bodily and mental power. The rural population forms the substratum of society. From its ranks are recruited the supply of the most reliable and successful business and professional men, and the most efficient and useful women.

I feel assured that it is unnecessary to attempt any extended argument to convince the intelligent members of this convention of the importance of a properly-conducted agricultural society as an educating agency, and of its beneficial influence, direct or indirect, upon every industry of the country. It educates socially—old friends meet and new acquaintances are formed. Friendly intercourse with neighbors lightens toil, tempers the pangs of temporary adversity, and heightens the pleasures of prosperity. It educates intellectually; mind comes in contact with mind, and free discussion is had; objections are considered and friendly emulation and wholesome criticisms are indulged in. Here, as in politics or ethics, every question has two sides, and truth can only be reached or agreement secured by a fair and honest interchange of opinion. The results must be seen in improved culture, better fruits, better stock, better implements, better methods of using them, higher hopes, wiser faith. It is highly encouraging to witness the growing activity which is now manifest in the organization of local agricultural societies. These farmers' clubs and town granges are becoming a power in the land, as well as useful agencies in promoting and imparting agricultural science. Many false theories will be advocated, no doubt, but agitation and intelligent discussion can scarcely fail to end in good. These local clubs, organized for the mutual improvement of their members, are so many normal schools, whose work it is in part to help prepare teachers in the science and art of agriculture. At these neighborhood meetings of practical farmers, the results of individual experiments are brought together and compared, new discoveries are communicated, errors are combatted, and a higher and better knowledge of the theory and practice of farming is secured. The means employed by the town or district grange or club to secure the culture and improvement of its members must chiefly be the library and stated meetings for the discussion of such questions as most nearly concern the little community of farmers who are represented. The association is composed of those who know each other as neighbors. Its members are therefore easily led into such inquiries and expression of opinions as observation and experience has suggested, and an ambition is stimulated to make common to all the successes of the most fortunate of its members. The very quickening of the mind which naturally grows out of these discussions is one of the most valuable fruits of the local organization. Because of his isolation and of the quiet nature of his employment, the mind of the farmer tends to grow, or rather to remain, dull and inactive. But stir him up, set his intellectual powers into active operation at frequent intervals, and he at once becomes a thinking, progressive man, not only ready to learn from others, but competent to devise and investigate for himself.

Mr. W. D. Hoard spoke of the great importance of market-fairs in securing remunerative prices for farm-products, but failed to properly explain the manner of organization and the working of the system. He said:

The whole matter lies in the solution of one question: How shall we market our produce? The solution of this question soon pressed itself upon the attention of our dairymen, and to take the first step they organized a market-fair and held their first market-day at Watertown, in Jefferson County. Commission men and dealers in Milwaukee, Chicago, and other places, and all the cheese-makers throughout the State, were invited to attend. They came, but it was soon evident that the dealers were not satisfied, and they took every opportunity to hinder and discourage the enterprise. They began to ignore the market-days. Nothing daunted, the dairymen looked elsewhere for a market, and commenced shipping cheese to New York, and even to London direct. They soon discovered that Wisconsin cheese ranked as high in those distant markets as that made in the State of New York. High freights was one difficulty that must be overcome in some way, and the best way was to establish these market-days, collect our products together at some point, and combine to secure the lowest rates possible. The dairymen of Jefferson County have received a proposition to transport their cheese to Liverpool for 95 cents per cwt. In no other way could as favorable figures have been secured, and with as little trouble and expense as by this system of market-fairs. What has been realized by the dairymen may be secured by farmers in any other line of produce by means of similar agencies.

In reply to a question as to how farmers' clubs could be formed for shipping their pork without the necessary capital, Mr. Hoard said:

This point can be illustrated by citing the case of a farmers' club in Illinois, which formed an organization to dispose of their pork. They made a statement of the number and kind of hogs they had to sell, which they sent to various pork-packers. This large amount of pork, controlled by a single organization, and which might be acquired by a single purchase, soon attracted the attention of dealers, and the result was, they sold to them direct, at the highest market-price, and saved the large percentage which usually goes to middlemen in such transactions.

Mr. Favill gave his views on several of the topics under discussion, and spoke particularly of the co-operative schemes which had been urged. He was of the opinion that the trouble did not originate with the market or middle men. The present system of farming and the way it had been carried on was where the fault was to be found. He never knew a strictly grain-growing community that ever became rich. It was because they were selling their farms by the bushel. He never knew a stock and dairying community that did not become well-to-do. The dairy business was more certain, its products more stable in price, than any other branch of agricultural industry. About 11 bushels of wheat are raised per acre on an average, which sells at $1.25 per bushel. There was very little profit in such yield—men would grow poor at it. Expenses are too high to make it profitable. The Pacific slope can raise wheat much cheaper than it can be raised in Wisconsin. What, then, shall we do? Raise beef-cattle? It costs too much to raise corn to make beef at a profit in competition with the two great corn-growing States of Indiana and Illinois. So with horses; so with hogs. Then what shall we do? His advice was to engage in the dairy business. Not that he would have farmers abandon these other branches of industry, but make them in a certain sense subordinate to dairying. He had not lived long enough to see butter and cheese sold too low to be profitable. He had sold cheese at 5 cents per pound, and had made money at it. But would it do for all farmers to engage in that business? He did not think there was any danger in that. He would not advocate dairying exclusively, for every farmer ought to raise his own wheat, corn, pork, &c., and convert what surplus he may have into a more compact form for transportation.

Mr. E. E. Bryant urged co-operation as the only true system, both as it relates to the buying of their supplies and the selling of their products. This can only be effected by combined action, using as the means for a remedy farmers' clubs, agricultural societies, and the granges. The advantages of a combined system, as it relates to purchasers, are thus given:

1st. It enables farmers to make their purchases at a very considerable saving in cost. 2d. It would tend to make them systematic in forecasting their wants, regular in their expenditures and payments, and to prevent that habit of incurring numerous little debts here and there, which is the farmers' easily-besetting sin and fruitful source of embarrassment.

Mr. M. Anderson spoke at length of the advantages of a system of co-operation, and in order to break down existing combinations, affecting the interests of the farming community, urged speedy and united action. Of some of these combinations he said:

The railroad companies are so organized and united that they do not compete with each other; they hold meetings and agree to parcel out among themselves the whole of the country traversed by railways, so that there will be no competition among them. I will give an instance of unfair discrimination in which I am somewhat interested. The railroad charges on live-stock from Cross Plains to Milwaukee is $38 per car. The same company carries live-stock from Monroe to Milwaukee for $20 per car, which is

about the same distance. This is only one among hundreds of instances that might be given to illustrate the unfairness of permitting railroads to regulate freights and to discriminate against one town or station in favor of another.

The freight on a car of cattle from Chicago to New York is at present $140. That is the minimum, and for all excess of over 30,000 pounds is charged at the rate of 70 cents per 100 pounds. The charges on a double-deck car of hogs is $154. I believe that hogs could be taken by rail from Chicago to New York for $54 per car, instead of $154, as now charged. This would give the company from $1,000 to $1,200 per train, or nearly $400 per day; but at the present charges, if the train consists of thirty cars of cattle, it would be $4,200 per train from Chicago to New York. If the train is run at the rate of fifteen miles per hour, it would take two and one-half days to make the trip. But count three days, and six men to each train, and count for change of men nine days for each man, of eight hours per day each, which is certainly liberal, and their combined wages would amount to $162; count coal at $138, which would pay for twenty-five tons; allow for wear of cars and road, salary of officers and interest on capital, and you have $3,000 left to the company for running a single train from Chicago to New York. Can any honest man believe that such charges are just, or that the people should submit to or allow themselves to be robbed in this way?

Another wrong I think ought not to be submitted to by the farmers is the present price and manner of selling agricultural-implements. We pay double the actual cost of manufacturing (allowing lawful interest on the capital invested) for farm-machinery. I was informed by a reliable man, who knows whereof he speaks, that the actual cost of manufacturing a thrashing-machine with power is less than $250. I believe that the agents are willing at present to accommodate the farmers with one at from $600 to $700. I venture to say that the best reaper made in the United States, where made in large numbers, costs less than $75 each. One of these very enterprising reaper gentleman, who holds a special privilege to sell machines, will accommodate you with one of them at $225. The same ratio of extortion, I believe, extends through nearly all of the machinery and farm-implements that we have to buy. A sewing-machine that your wife has to pay $75 for, I am told, is put up by the manufacturer in boxes ready for shipment for less than $20 each.

Mr. Stilson read a paper on the subject of sheep-husbandry, in which he warmly urged wool-growing in Wisconsin as an important part of mixed husbandry. Of all domestic animals he regards the sheep as unrivaled in its adaptation to preserve and increase the fertility of the soil. In the course of his essay he says:

There are two entirely different modes of sheep-husbandry. The pastoral mode is pursued in mild climates principally for the wool alone, and has no connection with the other industries of a country, and builds up no cities and maintains no schools, and is mostly so pursued in semi-civilized countries; but this is not the class of sheep-husbandry that we advocate. It is that class of sheep-husbandry that is pursued in mixed agriculture, that is truly valuable to a civilized country—that class that enables the farmer to increase the productive power of his farm, and thus increase his own revenues in the same proportion as the productive power of his land is increased, and helps to build up all other industries which pertain to civilization, and invites the manufacturer to our doors, not only to manfacture our wool, but to help consume our other agricultural products. * * * While corn west of the Mississippi is being burned as fuel or transported thousands of miles to feed operatives, why not cover a portion of those corn-fields with sheep, and import the manufacturer and his operatives, instead of their goods, and help to build up a home market? If the corn was fed to sheep, and the wool was shipped to New York or Boston, two quarts of the corn so fed would pay the freight on the wool grown from one bushel of corn, thus taking only one-sixteenth instead of six-sevenths of the corn. Many other manufactures are equally advantageous to build up a home market. The county of Winnebago is the second county in the State in the extent and variety of its manufactures, so that it presents a good opportunity to study the advantages of a home market. Take the article of wheat as an illustration, and with its large number of flouring-mill monopolists, as some are disposed to term them, and the demand for wheat caused thereby, and the farmers will, on an average, obtain 5 cents a bushel above Chicago and Milwaukee prices for their wheat. The manufacturer is not the enemy of the farmer, small politicians and some so-called political economists to the contrary notwithstanding. While the great battle is to be fought in favor of cheaper transportation, let us call in such auxiliaries as building up a home market and the growing of such products as pay the least for transportation.

Essays were read and addresses delivered on "Horses," "Short-horns," "Jersey Cattle," "Ayrshire Cattle," "The Poland-China," "Essex," and other breeds of hogs; but, as a general thing, they contain little that

is new to those who have devoted attention to these various subjects. Mr. M. Anderson, in a brief essay on the Poland-China breed of hogs, thus alludes to their introduction into Wisconsin:

Mr. William Kizer, now a resident of this county, brought the first hogs of this breed into this State that I have any knowledge of. I purchased the first hogs that I had of this breed from Mr. Kizer. I have added to my stock from year to year from some of the best breeders in this country, including Magie, of Ohio, and Moore, of Illinois. I believe we have now in Wisconsin as pure-bred and as good Poland-Chinas as can be found anywhere. To show how little some farmers in Wisconsin know about the different breed of hogs, I wish to state that when Mr. Kizer first exhibited Poland-Chinas at our State fair he was not permitted by the officers of the society to enter them as a large breed, but had to enter them as a small breed. I purchased of Mr. Kizer one of the pigs entered as small breed, and when I sold it it weighed between seven and eight hundred pounds. So great was the prejudice against the black color at that time, that Mr. Kizer was not awarded any premium, although, I believe, he had the best pigs on exhibition.

Mr. Alfred Palmer contributes a paper on the subject of the artificial rearing and domestication of brook trout. He says that, while this is the wildest food-fish known, when it once becomes domesticated it is perfectly tame, and is more attached to its home than any fowl or animal. Indeed, he regards it as an impossibility to drive a school of these fish from their pond or pool; and the farmer who owns the head of a brook can stock it without the fear of those below him ever being benefited thereby. They will only leave a home that suits them at the spawning season, and then stop at the first suitable gravel-bed that is unoccupied, deposit ther spawn, and, after lingering around a few days, apparently to guard it, will return to their homes. Nature has been very prodigal in providing fish with the means of procreation, so much so, that the ordinary observer, on seeing the amount of spawn they contain, wonders that they do not become so plentiful as to obstruct the free use of water for mechanics and navigation; but investigation shows that this spawn is not yet fertilized, and the probability is that not one in ten of the spawn of wild fish ever is impregnated. The unfertilized spawn not only spoil themselves, but cause all that are near them to decay, and the impregnated spawn, as well as the young fish, during their helpless stage, are a prey to other fish, rats, and various water-fowls.

In the course of a detailed statement of his experiments in wheat-culture, Mr. N. E. Allen says that by a proper system of rotation of crops he has more than doubled the production of his farm during the past five or six years. He says:

I made a statement last year at the convention that my crop was nearly twenty bushels per acre average that year, and that I hoped to raise 25 bushels average the coming year. I have not quite done it, but should have done so only for a calamity that befell a part of my crop of about 15 acres, which the army-worm destroyed, or materially injured. Still, from 94 acres my crop was almost 2,200 bushels, thrasher's measure; by weight it would have exceeded that, as the wheat had no weeds or foul seed in it, and was plump, good grain. If the 15 acres injured by the worms, which did not yield more than 12 bushels per acre, were deducted, it would show an average fully equal to my estimate last year. My poorest crop, aside from that portion injured by the worms, was, on corn-ground, 18 bushels per acre; the straw was large enough, but the wheat was missing. My best results of spring-wheat were on clover-sod broken in October and November, after cutting my clover-seed—27 bushels per acre on 28 acres. My best crop was winter-wheat, from 14 acres, thrasher's measure—four hundred and sixty-two bushels of the very finest wheat; by weight it would exceed that, making a little over 33 bushels per acre.

I made a statement last year that I hoped to raise 25 bushels the coming year, average. I now state that I hope to raise 27 bushels next year, if no calamity befall it, and I intend to increase the acreage some 20 acres. The question, perhaps, is, how do you do it? There is no secret about it. Any man can do as well—only sow plaster and clover.

My plan of rotation is somewhat different from others. I alternate each year with wheat and clover, excepting corn-ground, which I sow to wheat or barley after, thus not keeping any piece more than two years without clover; seeding at the time of sowing wheat, sowing plaster at the time of seeding, or before, 100 pounds per acre. The year following cut the first crop of clover for hay and the second crop for seed, if it fill well, or if not, for hay. Then break the ground, and in the following spring sow to wheat and seed to clover again. I sow clover-seed on all the land I sow to grain, even if I plow it up in the fall. Frequently, the growth of clover from spring till fall will be as much as can be turned under with a good team and the best plow. It is better to raise clover than weeds; wheat will fill better with young clover in the bottom, particularly if, as is sometimes the case, several days of very hot, dry weather continue just as the wheat is filling or ripening. The clover shades the ground and keeps it moist and cool. If the chinch-bugs should be troublesome, they will have a poor chance to do much damage with a thick mat of clover on the ground. "But," says some one, "I cannot make clover grow in that way." No, you cannot, unless you sow plaster at the time of sowing the seed. It is not the quantity of seed we sow on the ground that makes a good seeding, but the quantity we make live. Plaster sown at the time of seeding will surely do it, and continue strong in the land to produce a crop of clover as thick and big as the very best mower will cut the succeeding year.

My best results in wheat-raising during the past four or five years have been on clover-sod, turned in in the fall after cutting the second crop of clover for seed, with plaster sown in the fall or early in the spring, at the time of sowing the wheat, at the rate of about 100 pounds to the acre. As stated above, my crop put in this year in that manner was 27 bushels per acre. In June after I sowed the remainder of the field to plaster. The wheat had become stunted, and looked yellow and sickly on the part not plastered; on the other it was rank and vigorous, and continued so. Now for the results. They opened my eyes and understanding. The part plastered in the fall yielded 25 bushels to the acre, of first-rate wheat, weighing 57 pounds to the bushel; the other, 15 bushels to the acre, and weighing 54 pounds to the bushel. What was the cause of the difference? Simply, the plaster started a strong growth of wheat from the commencement, and continued it until it came to maturity. In the other case, the wheat had become enfeebled, but the plaster started a vigorous, active growth from the time it was sown, causing new rootlets to start, and making the wheat later, thereby causing it to shrink and rust. I am aware the common opinion is, that it is poor economy to sow wheat or grain on new sod-land; so, indeed, it would be, only for the plaster to aid in assimilating the decaying vegetable substances in the soil to the growth of the wheat, which it will surely do. But is it possible to take two crops of clover from the land and still improve it? So it has proven with me, and I believe the land derives more benefit from the roots alone, when they are mature and ripe, than to turn the whole crop of clover in a green state, full of water and undeveloped nitrogenous matter, which will not be the case after the plant has matured its growth. In that way the roots alone will furnish more vegetable food than the crop turned in a green state, particularly of a character to make a kernel of wheat, which is the thing we are working for.

In reference to manuring land, the most benefit I have derived from manure was from its being spread on the land after the first crop of clover was cut, letting the second crop of clover grow and shade the manure, which it will surely do, and lodge, keeping it moist, enabling the land to absorb the ammonia of the manure. When the land is plowed it will be found as loose and friable as a heap of ashes. * * * * From two crops of clover as much profit can be made as from the very best crop of wheat. Frequently the crop of seed will pay more profit than a good crop of wheat. So the farmer's balance-sheet of profits will be much larger than from half a crop of wheat, with a prospect of a material increase of the latter after the clover is taken off.

It was before stated that the cranberry-crop had already become a source of great revenue to the people of this State, and that the acreage devoted to its cultivation was rapidly increasing. In a paper read before the convention, Mr. H. Floyd gives the following instructions for the proper planting and cultivation of this vine:

First, after the tract is surveyed, and your outlet determined upon, make some trial levels from which to locate the main ditches, the width and depth of which will depend upon the character of the marsh, varying from 4 to 10 feet in width, and from 1 to 2 feet in depth. After these are cut, then cut side ditches, from 1 to 3 feet in width, and from 10 to 40 rods apart, and clear the surface of all plants detrimental to the growth of the cranberry-vine. Tamarack swamp is quite difficult to convert into a good cranberry-marsh, but the open swamp can be cleared and converted with great profit, if it is the right kind of bog. Sage-brush is the most formidable plant-enemy the cranberry-vine has to contend with. Its condition is as much benefited by the improvement of the marsh as the cranberry-vine itself, and will fully occupy the

ground in defiance of the vine if let alone. Hence its encroachments must be constantly guarded against.

If the marsh is to be planted with vines or sown with seed, the sage-brush should be exterminated from the marsh so far as is practicable, since it propagates itself by suckers and seed. A plant known as featherfow grows to some extent on the margin of marshes, and should be eradicated, since it will spread as the marsh becomes dry. A dwarf willow is found on nearly all the marshes, growing about one foot in height, and by some is regarded as a benefit rather than an injury, as it is a slight shade to the cranberry-blossom, which appears the last of June or first of July, preventing blight from excessive heat. I know of places where it occupies the ground to a considerable extent, and do not regard it as much of an enemy to the cranberry-plant. I also believe that if the marsh is kept wet enough when the vines are in bloom, there will be no danger of blight, since the vapor arising will tone down the heat enough to prevent it. On the highest and driest portions of nearly all cranberry-marshes, we find the different varieties of the willow, alder, grass, brakes and other rubbish growing. There the vine cannot flourish. The best way to improve such places is to scalp the entire surface and burn off, or save to compost.

Cranberry vines are readily grown from cuttings or from seed. Hence, when the marsh is clean and ready to be stocked with vines, it is easily done by planting in any way, and at any distance you choose, or by sowing seed in early spring. Vines planted three or four feet apart will, under favorable circumstances, cover the surface in four years. After the marsh is stocked, a substantial dam and waste-gates should be built at the best point at the outlet, to flow and regulate the water on the marsh. The water should be put on about the 1st of November, and drawn down to surface of marsh about the 1st of June, and as soon as the fruit is set, it should be lowered 4 or 5 inches in the ditches. As the crop approaches maturity, continue to lower the water, and have the ditches dry if possible at picking time, which commences about the 20th of September. Picking is done by men, women, and children, at 6 shillings per bushel. Women are the best pickers, getting from three to five bushels per day. On large marshes, the fruit is taken on a car by rail to the store-houses, where it is elevated to the upper story and run off into bins. The fruit should not be stored in bulk to a depth that will cause it to heat; heating and sweating destroy the enamel on the surface of the berry, and the fruit soon decays. Hence they should be stored in shallow bins, not to exceed one foot in depth, and these bins should be so arranged as to drop the fruit from the one above to the one below. This will air the fruit from time to time, and by the time it reaches the lower tier of bins it will be fit to barrel, if obliged to be done on account of want of storage. In barreling, the fruit is first run through a fanning-mill, then poured on to an inclined board and run from thence into barrels, being examined, as they pass along, for damaged berries, which should be removed.

A liberal appropriation has been made for a thorough geological survey of the State, which is being prosecuted under the superintendence of Professor Murrish. The work was commenced in June, 1873, and is to be completed within four years. A report of the preliminary survey of the mineral regions is contained in the present volume of transactions of the State society, but unfortunately it is lacking in a map showing the location of mines and minerals, and their nearness or remoteness to lines of transportation. The survey has already demonstrated that vast deposits of iron and other minerals exist in several counties of the State, which heretofore have been supposed to contain little or no mineral lands. Coal, iron, zinc, and lead are among the minerals discovered in the greatest abundance.

The annual exhibition of the society for the year 1872 was held in Milwaukee, commencing on the 24th and ending on the 28th of September. The weather, with the exception of one day, was very unfavorable, and seriously affected the success of the fair. However, the display of stock, agricultural implements, and productions was an improvement on previous exhibitions. The opening address was delivered by Mr. B. B. Hinkley, president of the society, who stated that the association was organized in 1851—twenty-one years ago. The first exhibition was held in Janesville in that year. It was a slim affair, but was the beginning of an important work, and led to the formation of county organizations, many of which have long since eclipsed the pio-

neer effort of the State society. Since that date fairs have been held annually, except in the years 1861–'62–'63, when, owing to the occupation of its grounds by Government troops, and the general disturbance of social and industrial affairs, the annual exhibitions were postponed. The president thus alludes to the good results of these exhibitions:

How successful these exhibitions have been, as such, will appear upon an examination of our annual reports. How successful they have been, as an influence, leading to reforms in agricultural practice; to the introduction of better breeds of stock of every kind; to the improvement of farm machinery and its general use; to the influx of immigration based on the demonstration they have made of the fertility of our soils, the favorableness of our climate, &c.; contributing to the success of railways and the necessary internal improvements, stimulating the inventor, the artisan, and the manufacturer to greater effort, and helping to secure to Wisconsin a high standing as an enterprising and prosperous commonwealth—how much they have done for the State in all these ways, can hardly be estimated. * * * Touching the office of the society as a collector, digester, and diffuser of information relative to the several branches of our State industry, I find it the more easy to speak freely because that important duty has almost exclusively devolved upon another than myself, and for at least a dozen years has been so well performed that none but words of high commendation can be justly spoken of it.

In all, we have published ten volumes of what we call the society's transactions. These volumes, besides the good they have accomplished at home, have found their way into the leading libraries of the country and of Europe, and are now eagerly sought by various industrial and scientific societies and institutions in all parts of the world. They are not only the authoritative representations of the resources and industry of Wisconsin, but they also serve to mark for the political economist, social philosopher and historian, of whatever country, the height to which our State has risen in the scale of material and even social development. They also abound in information and doctrine of the most universal application. Together they contribute a series of reports to which any member may properly, and with pride, assign a conspicuous place in his library.

Financially considered, the fair has been very successful. Its annual receipts have advanced from a few hundred dollars to $27,747. The treasurer's report shows this to have been the total amount of receipts for 1871, and that after paying all premiums and meeting all obligations, including over $2,600 due on real estate, there was still left in the treasury a balance of $5,954.

Details of important experiments conducted at the university farm are contained in this volume of transactions, but are noticed elsewhere in this report.

VERMONT.

The annual report of the Vermont State Board of Agriculture, Manufactures, and Mining, for the year 1872, is one of unusual interest. The volume is well printed, contains 734 pages, and is replete with articles of great value to the people of the New England States. It was prepared and arranged by Professor Peter Collier, secretary of the board, and printed under his direct supervision.

The law creating the State board was approved November 22, 1870, and the first meeting held thereunder took place in Burlington on the 19th of January, 1871. At this meeting the organization of the board was completed by the election of Professor Peter Collier, of the State Agricultural College, as secretary. At the second meeting, held February 9, 1871, the secretary, at the request of the governor, presented the following practical details of work for the consideration of the board:

Agriculture.—1. To supplement other organizations for similar objects in the State, so far as we may do so and preserve our individuality, but to supplant nothing. 2. To co-operate with county and town societies, and through them secure some uniform and systematic plan of work throughout the State. 3. To suggest to dairymen, farmers, and stock-breeders certain definite experimental problems. 4. To procure analyses of all fertilizers (natural or artificial) for sale throughout the State, and publish them in full with their relative and commercial values, and to secure protection against

frauds by legislative or other action. 5. In accordance with the provisions of the act, to hold at least one annual meeting at some central point in the State for the purpose of discussion and the reading of papers. 6. Under the auspices of the local societies and co-operating with them, to hold meetings of the board from time to time in the various counties, of the same general character as the State meetings.

Suggestions relating to the manufacturing and mining interests of the State were made, and the plan of the secretary was then adopted.

In accordance with the fifth and sixth suggestions meetings of the board were held during the years 1871 and 1872 at Saint Johnsbury, Brandon, Randolph, Burlington, Middlebury, Montpelier, Saint Albans, Newport, and Craftsbury. The meetings generally were well attended, and the discussions participated in by many of the leading agriculturists and manufacturers of the State. From three to five sessions of the board, of several hours' duration, were held at each point. Each essay was prepared especially for the occasion, and was generally followed by a more or less lengthy and animated discussion. At the first meeting of the board, while its object and aims were under discussion, President Buckham said:

In the case of any industry whatsoever, if you can persuade a few only of the best men in it to bring their whole intelligence to bear upon its improvement, upon the perfection of its processes, the adaptation of natural and mechanical forces to its uses, and the increase of its profits, the consequence will infallibly be to infuse into the whole body a new spirit of enterprise, which in due time will work out the most unexpected and gratifying results. To this point agriculture has now come. Never before has it enlisted so much intelligence or prompted so much inquiry and study; never was the aid of science invoked with so much deference and docility; never was there such eagerness to appropriate any knowledge or experience which might contribute to success. And though it must be confessed that only a few of the great mass of farmers in our country have as yet felt this new impulse, still the best men are all thoroughly awake and are putting into the work of improvement such an amount of brains and energy that the contagion of their example and the eloquence of their success will ere long bring over the skeptical and the lazy.

During a discussion of the same subject, Professor Collier called attention to the fact that the duties of the board embraced not only the promotion of agriculture, but the introduction of manufactures and the development of mining. The farmer was greatly concerned in these branches of industry, as they increased the consumption of his products and gave him a home market. Many farms embraced valuable water privileges, where vast quantities of unused force went to waste for want of means, knowledge, and energy requisite for its improvement. The State is rich in minerals of great value in the arts. The development of this branch of industry has been commenced with success, such as ought to encourage further labor in this direction. Marble and granite of fine quality, slate, copper, chromic iron, and many other valuable minerals have been discovered, many of the quarries and mines of which are now being worked with great profit. It is his opinion that there is hardly a farm in the State where hidden wealth may not exist.

Dr. T. H. Hoskins contributes a paper on the difficulties of fruit-raising in Vermont. He divides these difficulties into four heads: 1. Difficulties arising from severities of climate. 2. Difficulties incident to soil and location. 3. Difficulties caused by insects and vermin. 4. Difficulties arising from the ignorance or the indifference of the cultivator himself. The severity of the winter temperature of Vermont entirely excludes the cultivation of the peach, except in a few favorable localities in the southwestern section of the State. In the northwestern section the same cause limits the number of varieties of apples that can be successfully grown, excluding, among others, the Baldwin, Rhode Island Greening, Roxbury Russet, Northern Pippin, and King of Tomp-

kins County. The blackberry and the foreign raspberries require protection in winter, as do also grapes. Notwithstanding the extreme low temperature of the winter months, the writer is of the opinion that there is no part of the State too inclement to prevent a high degree of success in the cultivation of apples. But this success cannot be attained without intelligence and experience. The same knowledge, patience, and skill that ensure success in other departments of agriculture, will equally ensure it in orcharding. The following list of the hardier sorts of apples is given, from which the writer says selections can be made adapted to any section of Vermont:

Summer apples.—Red Astrachan, Peach Apple, American Summer Pearmain, Tetofski, William's Favorite.

Fall.—Duchess of Oldenburg, Saint Lawrence, Fameuse, Clyde Beauty.

Winter.—Yellow Belleflower, Tolman's Sweet, Blue Pearmain, Red Canada, Pomme Grisay, Westfield Seek-no-farther, Northern Spy, Ben Davis, Ribston Pippins.

These are all well-known varieties, valuable for their market qualities as well as for domestic use. Currants and gooseberries do well in any section of the State. In the coldest localities only the common red cherry can be raised; but in many portions of the State the Dukes and Morello flourish. The Red Canada and several blue and yellow varieties of plums seem to do reasonably well in some of the colder localities, while many sections of the State are admirably adapted to their cultivation, and were it not for the ravages of the curculio could produce them abundantly for market. The hardier varieties of pears endure the winters, and in some places give very fair returns.

The writer gives a list of the insects and vermin which depredate on the trees and fruit, and recapitulates many of the old and some of the more recent modes for their destruction. Of the difficulties arising from the indifference or ignorance of the cultivator, he says:

On this point let me say that there is no difficulty in the whole business, from beginning to end, that any man capable of success in growing the ordinary crops and breeding the common animals of the farm cannot easily surmount. Of course each man has his peculiar tastes, and is naturally directed by them. But a man can, if he thinks it desirable, though he have no taste for it, become a successful fruit-grower. He would not find it so easy and pleasant as the man who loves it, and I would not advise such a man to make it a principal business. But there is no reason why he should not give it sufficient attention to provide fruit in abundance for family use. I have no taste for horses, but I can care for as many horses as I require for my work as well as any one. So the man who is fond of horses or stock can, in the same way, give the needful attention to an orchard or a fruit-garden. All that is wanted is the will to do it.

The following extracts are made from a paper entitled "Fruit-growing in the Champlain Valley," by C. G. Pringle, and read at the meeting of the State board at Middlebury:

The fruit-interest of our valley bids fair to rival in importance even the dairy-interest, now so prominent. The large area already devoted to orchards, (especially in the immediate vicinity of the lake,) and the large returns made by those which have now come into bearing, suggest a prosperous future for our farmers. Though situated on the northern limits of "bleak New England," the valley of Lake Champlain lies low and warm within its mountain walls. Secluded from the cold winds of the northeastern coast, and open on the south, through the valley of the Hudson, to the genial influences of the Gulf Stream, it enjoys through the four summer months a climate but little inferior, in its adaptation to fruit-growing, to that of Central New York. True, its area is limited, and in winter, after the lake closes over, it cannot escape the rigorous frosts that belong to its latitude; yet the hardier fruits may be grown here in such amount and of such peculiar excellence as to insure the valley a fair fame among the fruit-growing regions of the Union. * * * But the inquiry may be raised, "Is not our fruit-interest in danger from western competition?" And the question would seem to be answered affirmatively by the fact that Michigan apples only last fall were brought into our State and sold at prices which caused our growers and dealers heavy losses. But another significant fact remains to be told. Those same

Michigan apples in this month of January are melting down to a mass of rot, while our home-grown fruit, matured through our cooler autumn, opens nearly as fair and sound as when put up. This fact gives our fruit an advantage which places it above all peril from any competition, and assures us not merely of first-rate profits, but of exceptional profits.

As to the proper time for gathering fruit the writer says:

It is well known by observing horticulturists, that winter-fruit may become over-ripe while yet hanging on the tree, so that its season is advanced. Such was the case during the very warm and late fall of 1870; and the following winter there was a complaint all through the country that fruit could not be kept. In some places it was gone before New Year. There is a time in the life of fruit when its growth is complete—when it will receive nothing further from the tree. It is then tree-ripe. Shortly after begins after-ripening, a chemical change, whereby the starch, abundant in the unripe or green fruit, is transformed into sugar. At the completion of this saccharine change the fruit is in the best condition for use. But almost immediately putrefaction sets in, first dissipating the volatile aroma and destroying the delicate flavor, and finally converting the grateful sugar into an unwholesome acid and consuming the very tissues of the fruit. Though a low temperature and dry atmosphere may sometimes retard this change, yet so easy and rapid is its progress that efforts to preserve the fruit after it has become ripe for use are of little avail. But the progress of the first change, the after-ripening, may be so delayed as to require several months for its accomplishment. It is done by taking the fruit from the tree at the moment of its maturity, and keeping it in a low, even temperature, in a dry, pure atmosphere, and secluded from the light. Fruit-houses are constructed where these conditions are secured almost in perfection; where the thermometer, for instance, does not rise above 34° for months together, and fruit kept in them has barely ripened for the late spring market.

Speaking of the Baldwin, Mr. Pringle says that in unfavorable soils and exposure, and at a distance from the lake, it is tender and short-lived, but in the valley it will often succeed if grafted in the head of a hardy stock. Next in value, and even more popular because more hardy, is the Greening. The King of Tompkins County and the Northern Spy, the latter very hardy though tardy in fruiting, are good keepers, and are freely planted. So of the Russets, Roxbury, Golden, and English, of which the Golden is most sought for, though the English is regarded as one of the very longest keepers.

In a paper read at the same meeting, Mr. Z. E. Jameson gives the following account of Mr. Owen Donegan's orchard, with a brief statement of that gentleman's mode of planting and cultivating an apple-orchard:

In December, 1871, I visited the owner of the best orchard in Orleans County, Mr. Owen Donegan, of Troy. Twenty-seven years ago he sowed the seed. The small trees were grafted or budded with hardy varieties. Some of them were transplanted several times before they were set in the orchard, each time giving them more room, until they were ten years old when they were set in the orchard, at the distance of 26 by 29 feet apart, at which distance Mr. Donegan expects their branches to meet in twenty years. He prefers to transplant several times, as it causes more small roots near the tree, and a tree properly raised can be transplanted when it is an inch or a little more in diameter as safely as at a smaller size. In setting out a tree he digs a wide hole with a hoe (using no spade) about 8 inches deep. He cuts off the tap-root of the tree every time, and places the side roots out horizontally, fills in among them some fine surface-soil, and hoes some earth over them. Then he puts three large stones around the base of the tree. These stones settle the earth around the roots and keep the soil more moist and warm, and keep the tree in its place, so that no stake is needed to steady it in the wind. When the ground is hard the stones are removed, but are replaced again when the hoeing is finished.

There are about five hundred trees in this orchard that bear fruit, and many small ones, and the intention is to set out two hundred each year until the whole number is twelve hundred. Then a few spare trees will be kept to fill the places of those that die. In pruning, Mr. Donegan cuts down half the year's growth in the center of the top and those cross branches that will be likely to touch each other in their growth. The side-branches are allowed to extend themselves as far as they please. When loaded with fruit they bend down, almost or quite touching the ground. This facilitates the picking, which is done by hand. * * * All the apples must be as carefully handled as eggs. They are laid in a basket, then picked from the basket and laid into the barrel, which is carefully filled so full that when the head is put in the apples

must be pressed down an inch or so. This keeps them from moving and bruising in transportation. Mr. Donegan values his reputation highly, and insists that none but perfect apples be put into the barrels. * * * This year the Bon Sweet were sold at $5 a barrel and his other varieties at $6. These varieties are the Brown Sweet, Fameuse, Blue Pearmain, Northern Spy, Jewett's Red, (or Nodhead,) and Yellow Bell. He has also a few other kinds. His abundant crop brought him this year $800, and he experienced no difficulty in disposing of all he could spare, and, indeed, was so importuned that his reserved supply for home consumption is less than he desires. Two years ago the product of his orchard sold for $650, and for several years the crop has been abundant. * * * The method of cultivation practiced here, was to manure and cultivate the ground for two or three years, while the trees were small, then seed to grass and mow four years, then plow and till two years, raising potatoes for a first crop and wheat or oats for a second; then reseed to grass and mow four years again. The result is that he gets the most fruit the first year he plows, and the best growth in the tree the year after it is seeded to grass.

Mr. E. R. Towle contributes an essay on the subject of the production of grass for hay, and the importance and value of the crop. He estimates the amount of hay raised in the State at 1,000,000 tons per annum, with about the same amount of grass in pasturage. The more recent method practiced for the laying down of fields of grass is to plant corn or potatoes one year, manure and seed to grass with sowed grain-crops the next. Sometimes oats are sown two years in succession, seeding to grass the second with manure. On good grain-land the first plan is most usually practiced, and perhaps with the best results, for the reason that the cultivation and manure necessary to secure a satisfactory crop fit the land admirably to seed down to grass. Where grass is the principal object, and a meadow needs reseeding, if the soil is mellow and free from stones, the sod can be nicely turned over and immediately seeded to grass, either with or without a grain-crop. Where this is practiced the ground should be thoroughly harrowed and a coat of fine manure applied. If seeded without grain, it should be done early in autumn, in order to secure as good a growth of grass as possible before winter sets in. This should be allowed to remain upon the ground and not by any means fed off. The grass will then act as a mulch, protecting the young roots from any injurious action by frost, and secure an early start in spring. Timothy, or herd's-grass, as it is usually called, and red clover, are the varieties principally sown, though other kinds are being experimented with. Where good crops of timothy can be had, it has been found that no other kind will answer so well for hay; but this is not always the case, especially the first year after seeding. Hence the necessity of sowing clover, which will produce one or two good crops, after which it will disappear, and the timothy will then take its place. Clover is considered a good forage-plant, and makes an excellent quality of hay when properly cured. Its mechanical effects on the soil are also beneficial, as it furnishes a valuable material to turn under for fertilizing purposes. Mr. Towle then gives the following directions for sowing seed:

A liberal quantity of seed should be sown, as this will be found to greatly improve the quality of the hay. Where timothy is employed alone, from twelve to sixteen quarts to the acre, according to the nature of the soil, are not too much; some may advocate a larger quantity. When clover is added, a less quantity of the first is required; perhaps from eight to twelve quarts, and from six to ten pounds of the last may be a fair proportion of each to use. These seeds should be well mixed, and sown with care, if by hand, to secure an even distribution. A surer way of doing this is by using the seed-sowing apparatus attached to Sunderlin's field-roller, which scatters the seeds much more evenly than can be done by hand. Grounds should be ready to seed to grass as early in the spring as possible after the soil is in fit condition, in order to secure a good germination and growth before the dry weather sets in. A moderately wet season is more favorable to a good catch of grass than a dry one. Wheat and barley are better crops to seed to grass with than oats, for the reason that the straw of these kinds of grain does not stand so thickly on the ground as that of oats, and perhaps is harvested a little earlier, especially barley. When seeding with oats, too great a quantity of the latter should not be sown if a good catch of grass is expected or desired.

The writer alludes as follows to Alsike clover:

It is only a few years since the Alsike clover has been employed as a forage-plant in this country. In size and appearance it is about half way between the red and white clovers. The blossoms are of medium size, white in color, tinged with red, the stalk slender and not very tall. It is later than red clover, and from this cause better adapted to sow with timothy. The seeds are so minute that a small quantity in bulk only is necessary to sow with timothy, three or four pounds being sufficient, say three quarts of each to the acre.

Mr. S. P. Joslyn also contributes an article on the subject of grass-culture. Of the preparation of the soil, and the planting and treatment of grass and meadow lands, he says:

Our recent frequent droughts, arising from a general destruction of the forests or other causes, render deep cultivation of the utmost importance to the grass-crop. With it, and liberal manuring, a good grass-crop may be obtained on most soils, even in seasons of great drought. The man who insists on shallow cultivation must, just so long, follow the skinning system. One writer, who believes in surface-manuring, asks us to be instructed by nature, in the large forest growth produced by an annual top-dressing of leaves. Surely, and does not that dense forest shield from the sun's rays and keep the top-dressing moist and pliable? Whereas we want the solar rays about the roots of plants, and a little artificial covering to keep the necessary dressing from being parched by them. I have used for some fifteen years, on a farm located on a spur of the Green Mountain range, with a westerly slope and loam soil, neither sandy nor clayey, one of Nourse & Mason's double-swivel plows. It does not turn a flat furrow-slice, but thinly skims the sward, then flings up loose earth, leaving an uneven surface, which facilitates commingling of the manure with the soil. I spread a coat of manure on the sward, and then the work of this plow, from the depth of from 10 to 11 inches, does something toward mixing it with the soil, instead of planting it all below a flat furrow-slice. Spread on another coat of manure, and the harrow, with the uneven surface, readily covers it, and it is fitted for a crop. Never take off but two crops while under the plow. Seed with the first or second, using one-half bushel of timothy-seed to the acre, one's own raising. If highly manured, on such land as I have described, no clover need be added; enough will be found in the crop. Thus treated, ground will produce a good crop of hay from eight to ten years without plowing. I have plowed thus and spread all the manure on the top, seeding down the first year, and obtained a good crop of grass, but it will not hold out nearly so long. Avoid too close or too early cropping of the aftermath. By all means avoid overstocking, summer or winter. It is a great bane to the farmer. Early-cut hay, well secured, will keep well for years. It is sure to be wanted. It will make an independent man of him in a season of short crops. The shallow cultivators will swarm about him like bees at such a time, if he has any feed for their starving animals. I have succeeded well with top-dressing. I have applied it in early spring and fall. It should be applied before the crop has much diminished. The quality of manure and time of application are of some moment, but to be sure that it is applied is of greater.

In reply to the question "Where do you get your manure?" Mr. Joslyn said:

I have had nothing to do with commercial fertilizers. They may pay on some soils and in some localities; but the best fertilizer is the brain, in securing all that can be made available on the farm for home manufacture of fertilizers. For a rule, feed out all produce of the farm on the farm, if it does not bring quite so much ready money. Keep a dairy; keep the swine at work; yard the cows, or with proper fixtures stable them, and let them have extra feed. What then will become of the pasture? Make up its deficiency by turning refuse mowing into pasture, and by entering partially into the soiling system. It is thus chiefly that I have succeeded in making two or three spears of grass grow where but one grew before, having raised two hundred and fifty ox-cart loads in a single year.

The report contains two excellent articles on the subject of dairying, but a lack of space forbids an extended notice of either of them. At the meeting at Montpelier, Mr. Leander Coburn read a paper on the subject of the manufacture of maple-sugar. As in the manufacture of butter and cheese and other articles, he was of the opinion that too much care could not be given the subject by those who desired to make a first-class article of maple-sugar. Like most articles of this character, the better the quality the greater the profit. From long experience in the business he has been led to believe that continued tapping of the trees

caused the sap to become sweeter, but as to the extreme limit he was unable to give an opinion. He gives the following as the main points on which the quality of sugar depends:

First, the sweetness and cleanliness of the tubs, and everything connected with the sugar-orchard, and without this requisite no one can make the best quality of sugar. And I think that tin tubs are much better than wooden ones, for tin tubs are easier kept clean and sweet. The sap will penetrate the wood of the wooden tub, and sours and dries during the last part of sugaring; and another advantage tin has over wood is, you can gather the sap earlier in the morning from the tin tubs than you can from the wooden ones. Most of the wooden tubs are manufactured of timber embracing the sap as well as the heart timber. This sap-wood sours much quicker than the heart-wood, so that heart-tubs are preferable to those containing the sap-wood. I notice that some use wooden tubs painted inside and out, and think them preferable to tin, as they do not warm the sap as much in a sunny day as the tin does, and will therefore keep the sap longer sweet; but the fact is that sap should not stand in any tubs longer than one can help, and as sap can be gathered from a tin tub whenever it is warm enough for it to run, and as it will keep longer in bulk if gathered when it is cold than it will in the sap-tubs, it gives the tin tubs an advantage in this direction.

Sap should be gathered and boiled as soon as possible after it has left the trees. This is one of the main points on which good or poor sugar depends, for the longer sap stands after it has left the trees, before it is boiled, the more color there will be in the sugar. Sap should be strained before it is boiled, to take out all foreign substances, and in boiling it one should make it a point to sirup-off quite often, as the continued boiling of the same sweet for a long time will color it, and the boiling-apparatus should be constructed with special reference to this idea, and the sirup should be sugared off as soon as it has stood sufficient time to settle, and it should stand in tin cans, and be kept in a cool, dark place if possible. Sap commences to change as soon as it leaves the tree, and should therefore be worked up as soon as possible; and our motto should be, in making sugar, first, cleanliness, secondly, expeditiousness, and thirdly, to get all foreign substances out of it, and to put none in, either in boiling the sap or in sugaring off.

During a discussion which followed the reading of this paper, many opinions were given as to the merits of pans and evaporators for reducing the sap to sugar. Mr. Coburn, who read the essay, stated that he always used small pans, but thought that evaporators possessed some advantages, especially in reducing faster and running off more quickly, but they were not so easily cleansed. He used galvanized iron for pans. Mr. Bisbee, while he preferred pans, thought evaporators gave a different flavor and color to the sugar and sirup. Mr. Andrews said that he was able, with an evaporator, to produce two hundred pounds of sugar in the same time that he could one hundred and twenty-five with pans, and that he had never been troubled in being run over with sap since he had adopted them. They required a little more care in using than did pans, but it could be afforded. All seemed to be agreed that the sooner sap was converted into sugar after it came from the tree, the less color there would be in the sugar.

A letter was read from Mr. Harmon Northrop, the leading points of which are as follows:

My sugar-house is on a hill-side, dug in, and set so that I can drive up and run the sap with a spout into the store-tub. Have a strainer over the top of the tub. Then carry the sap by spouts to all the pans—four in number. While boiling be sure and skim off all scum that rises. I make my sirup thick enough so that two pailsful will make one of sugar. I always strain the sirup, when taken off, into tubs, then let it settle two or three days more. Then when I go to sugar it, I dip or pour it off carefully, not letting any of the sediment at the bottom into the sirup. In order to make good sugar it is very important to boil the sap as soon as possible after it runs, especially in the latter part of the season. Some of my neighbors are getting evaporators. I have had no experience with them. But my opinion is that they cannot make as good an article in them as can be made in pans, for this reason: it is sugared without any settling. I have never been able, as yet, to make any sirup so nice but what there would be a black, gritty sediment after settling for a suitable time. For this reason I prefer pans. I think it a good plan, whenever the sap stops running for awhile, to turn the buckets bottom side up until it runs again, as it keeps them from souring.

Mr. H. A. Soule takes issue with Mr. Northrop, and replies by letter to the secretary of the board. This letter is appended to the discussion on the subject of maple-sugar making, from which the following extracts are made:

We formerly made our sugar in kettles, but were among the first to adopt the pans so strongly recommended by Mr. Northrop, and many years ago had all the spouts and strainers he speaks of in use. We spared no pains with our products, and when we heard of improvements in methods of manufacture or in apparatus, we investigated and adopted any which we found valuable. We think we were among the very first to adopt the system of boiling shallow masses, and, when the siphon-system of Mr. Smead was introduced, we procured the apparatus and used it a few seasons. By this system the cold sap was all run into one pan, and being kept by the siphon-connections at the same level in all, the sirup accumulated in the fourth or farthest pan. We do not hesitate to pronounce this as great an improvement upon Mr. Northrop's four-pan system as that is upon our original kettle-system. Meantime we were investigating the action and results of the "evaporator," which Mr. Northrop so positively condemns without a trial, and notwithstanding we were fairly fitted up with all the apparatus named above, we became convinced that our interest lay in discarding it altogether, and putting in the evaporator. Nevertheless, we determined to move safely, and took the evaporator only on trial the first year, but were glad to pay for it at the end of the season. * * * Mr. Northrop evidently does not understand the evaporator system of manufacture, but supposes that the sap is reduced to sugar at one operation. We do not know that such is the practice anywhere, or that it is recommended by any one, but of course it is possible, as it is possible for him to make sugar at one operation in his four-pan system. Of course the evaporator product in such case would be very much superior to the other, and the only serious obstacle to the practice is the presence of the substance which was spoken of in the after discussion as "niter," although it may be a question whether, in the entire absence of that substance, it would be good economy to make the sugar at one operation. We usually let our sirup stand over night to settle, but we do not approve of letting it stand two or three days, as recommended by Mr. Northrop. It is well known that light and air both exert unfavorable influences upon sugar-solutions, whatever their density, and Mr. Northrop's remark about the necessity of boiling sap as soon as it runs, is true of the solution in every stage of the manufacture. The sooner it is manufactured the more crystallizable sugar can be made from the sap, and the less uncrystallizable sugar drains out in the form of strong molasses. Our sirup flows from the evaporator in a small, steady stream, upon a sheet of thick flannel, through which it percolates into the settling tub, leaving upon the strainer most of the substance spoken of as "niter," the remainder of which will settle in one night as well as in one year.

Mr. O. C. Wait contributes a paper on the advantages of bee-keeping In proof of the assertion that bee-keeping is profitable, he gives the following statistics, gleaned from the proceedings of the American Bee-Keepers' Association at the meeting held in the city of Cincinnati:

We take all the full reports of those present who had over nineteen colonies of bees in the spring, numbering forty in all. The united number of colonies was 4,916, of which 2,777 were wintered, and 2,139 were the increase of the past season. The amount of honey gathered was 134,212 pounds, which sold at an average of about 29 cents per pound. The products were, as might be expected, exceedingly variable. Bad locations, severe droughts, rearing queens and multiplying colonies rapidly for sale, all reduced the amount of honey seriously from some large apiaries, but we include the failures as well as successes. The smallest quantity reported was five pounds per colony, from Ohio. The largest, J. W. Hosmer, of Minnesota, was 253½ pounds of extracted honey from each hive. This report, though unprecedented and startling, is from a man of known integrity, and far advanced in both practical and scientific knowledge of bee-culture. While living, as he does, on the margin of an immense bass-wood forest, he has very extra facilities. Now, 2,777 colonies divided by 40 would give 69 old colonies to each person. The average amount of honey would be 48½ pounds from each colony, 3,315 pounds for each bee-keeper, which, at 29 cents per pound, would amount to $971.35 for honey alone; 53½ young colonies at $5 each (exclusive of hives) would amount to $263.50, which, with about $20 for wax sold, would make $283.50, an ample compensation for the labor and incidentals, aside from permanent fixtures, which are a part of the investment upon which we are to compute the interest. As an investment, we have 69 prime colonies at $8 each, hives included, $552; honey-extractor, room for wintering, &c., $48; making in all $600 invested. Receipts for honey, $971.35, which, after deducting 12 per cent. ($71.35) interest and taxes, leaves $900, or 150 per cent. net profit.

The birds of Vermont, in their relation to agriculture, form the subject of a very able paper by Prof. George H. Perkins. There is only room for the following brief extract:

Probably very few persons have any idea what the state of things would be if birds were all destroyed, other things remaining as they now are. It cannot be unprofitable for us to devote a few words to this part of our subject. There are in the State of Vermont probably not less than eight hundred species of Lepidopterous insects (*i. e.*, the moths and butterflies,) and in the whole United States there are not less, probably, than four thousand. But leaving the rest of the States, let us confine ourselves to our own, and see what results we can obtain. If we suppose the number of species in this State to be eight hundred, the increase will be something like this: each female lays on an average three hundred and fifty eggs, but we will place the number at three hundred. Now suppose that in this year, 1871, there exists only one pair of each species, there would be during the year 240,000 eggs produced, which would develope into 240,000 caterpillars. If half of these were females, next year we should have 120,000 pairs of insects, which would produce 36,000,000 of caterpillars for 1873, and so on, so that in five years there would come from the unchecked increase of only one pair of each species 1,215,000,000,000,000 of caterpillars, or 200,000,000 for every single acre in the State. It is true that as the arrangement of things now is, not one in a hundred, if indeed one in thousands of these eggs ever reach maturity, but the great agents of destruction are the birds. Making all possible deductions on account of all destructive influences, except the birds, we have left a very large figure, and if this is multiplied by the number of pairs actually living on, and, as all know, of some kinds there are thousands, the product is something appalling. * * * If there is a race of beings on earth which should be protected from destruction by its relations to the general economy of nature, that race is that of the birds. Vengeance swift and terrible descends upon those who will not learn that they are important, nay, even necessary to the success of all agricultural pursuits. While we may be much aided by those insects that destroy others of their kind, we must rely chiefly on the birds, and in so doing we shall not lean upon a broken reed.

The report contains a number of well-prepared papers on the fertility and exhaustion of soils, rotation of crops, &c. Perhaps the most valuable contributions to this volume are the articles from the pen of Prof. Samuel W. Johnson, one on the exhaustion of soils and the other on a proper rotation of crops. A short but comprehensive article on the last-named subject is also contributed by Mr. W. S. Thorpe, whose system of rotation is as follows:

I believe that an eight-year rotation might be used with profit generally. This, allowing the farm 20 acres of woodland, would leave eight 10-acre fields. As labor is scarce and high, all wish to manage with as little help as possible. I think on that account grass may be grown with as much profit as anything, so I would apply grass to my rotation if convenient. This course, in going around the eight 10-acre fields in eight years, would allow me to have one 10-acre field in corn or roots; second year in wheat, barley, oats, or some other grain-crop seeded to grass; the next two years mowed for hay, and the next four years in pasture. I think this to be about equally divided for the keeping of stock summer and winter, supposing the owner to feed all the crops on his farm. By using a rotation and feeding all our produce on the farm, I believe we can keep two-thirds more stock than the majority of farmers do at the present time, and farms would be all under cultivation. We should have ten acres in hoed crops, ten acres in grain, and at a very low estimate we should get 300 bushels of potatoes, or 1,000 bushels of rutabagas or mangolds per acre, and four or five hundred bushels of grain annually.

The report contains many articles on various subjects of interest, which, for want of space, must remain unnoticed. Those on the mining-interests of the State are valuable, and indicate, as one of the contributors truthfully remarks, that there is hardly a farm in the commonwealth where hidden treasures do not lie buried.

DONATIONS TO MUSEUM.

Name.	Locality.	Donation.
Arguah, James G	Blairsville, Ga	Insects.
Arny, Governor	Santa Fé, N. M	Honey-ants.
Atwater, Dorence	U. S. Consul, Tahiti	Sample of silk-cotton.
Army Medical Museum	Washington, D. C	Insects.
Barber, George L	Georgetown, Ky	Pure-bred Cotswold wool.
Barnhart, P. T	Kittanning, Pa	Seedless apples.
Bickford, W. R	Washington, D. C	Seedling peach, (10-ounce.)
Bines, David A	Philadelphia, Pa	Houdan chicken.
Blood, H. A	Washington, D. C	Spider's nest.
Brooks, Thomas	Columbus, Ohio	Collection of corn.
Brown, William N	Mississippi	Large beetles.
Bryan, ——	Virginia	Curious growths in corn-cobs.
Bryent, A. H. R	Kemp, Tex	Work of carpenter-bee in cedar.
Bliss, B. K	New York City	Vegetables to model; silver buckwheat.
Campbel, George	Delaware, Ohio	Vines injured by the grape *Phylloxera.*
Carpenter, Charles	Kelley's Island, O	Currant-borers.
Carpenter, Lieutenant	United States Army	Insect injuries from Colorado.
Chapin, Charles	Washington, D. C	Colorado potato-beetles, (August.)
Chapman, W. H		Insects.
Clayton, H	Mount Pleasant, Del	Partridge cochin cock.
Costen, Hon. J. N	Boise City, Idaho	Idaho winter-barley, (117 bushels to the acre.)
Craft, C. S	Fountain, Colo	Corn.
Cromwell, J. W	Portsmouth, Va	Birds' eggs, (two collections.)
Davis, John	Crawfordsville, Ind	Corn.
Delafield, Julia L	New York	Grain grown from a few grains of "mummy-wheat."
Dodge, Charles R	Washington, D. C	Insect injuries; insects.
Eichliuberger, E	Northumberland Co., Va	Wheat-samples.
Erni, Henry	Basle, Switzerland	Collection of silks, showing aniline and other chemical dies, (very fine;) also, specimens of preserved meats.
Fessenger, J. G	Morganfield, Ky	Fine specimens of tobacco, (three samples.)
Fitzki, Edward	Washington, D. C	Antwerp rye, from Belgium.
Fuller, B. F	do	Grain, &c., from Illinois.
Foster, P. H	Babylon, L. I	Beetles.
Gass, A. M	Campo, Cal	Oak-gall insects.
Glasco, J. M	Upshur, Tex	Upland cotton.
Gramlich, F. G	Hyattsville, Md	Poultry for museum. Partridge cochins.
Griswold, Thomas	Wethersfield, Conn	Fine varieties of corn.
Goodwin, E. M	Hartland, Vt	Beetles.
Hanna, George B	Vernon, N. C	Insects.
Hastings, H. S	Nockeunt, Tex	Chrysalis of *Cossus.*
Harvey, William	Mobile, Ala	Insects.
Heaton, L. D	Victoria, Tex	Sponge-cucumber; yellow-headed blackbird; cocoons, &c.
Hurd, William D	Millersburgh, Iowa	Sorghum-sirup.
Kaucher, William	Oregon, Mo	Wood punctured by tree-cricket.
Keeler, W. P	Mayport, Fla	Miscellaneous collection of insects.
Key, Thomas J	Louisville, Ky	Chrysalids of *Pieris rapæ*, with parasite.
Kingsbury, W. G	Bexar Co., Tex	So-called flying scorpion.
Knapp, J. G	La Messilla, N. M	Apple-insects.
Kron, F. J	Albemarle, N. C	Silk, reeled specimens, and cocoons.
Land-office	Albuquerque, N. M	Cotton samples.
Mallet, Professor T. W	University of Virginia	Specimens of lichens used in dyeing, (by exchange.)
Marquardt, H	Pueblo, Mexico	Cactus-gum.
Mattoon, C. S	Honolulu, Sandwich Islands	*Pulu* used for bedding; chocolate, &c.
McClintic, William	Bath County, Virginia	Corn.
McCutchan, J. O	Lummerdean, Ga	Fruits.
McKinley, S. W	Felicity, Ohio	White tobacco.
Mick, Philip	North Vernon, Ind	Nuts, (three varieties.)
Miller, ——	Washington, D. C	Fantail pigeon.
Montgomery, J. W	Providence, La	Tahiti cotton.
Moor, N. B	Manatee, Fla	Luminous beetles.
Morse, Mrs. M		Club gourd.
Murry, Davis & Co	Cincinnati, Ohio	"Hill wheat" samples.
Ogden, ——	New Orleans	Tsetze-fly from Africa.
Perkins, E., M. D	Purdy, Tenn	Specimens of pears.
Piper, R. G	Gainesville, Tex	"Heel-flies."
Pile, William A	Caracas	Collection of South American beetles.
Robertson, General	United States Army	Sugar-pine cone, California; large Agaricus from Catskills.
Rathbone, Thomas	Washington, D. C	Insects.
Reich, Mrs. M. L	Near Arlington, Virginia	Ground-cherries.

Donations to Museum—Continued.

Name.	Locality.	Donation.
Rich, O. A.	Baldwin's Mills, Wis.	Apples.
Ross, W. W.	Dallas, Texas	Wheat-heads.
Scott, J. W.	Huntington, Maryland	Ortolan skin.
Seaman, William H.	Washington, D. C.	Wild cane from Dismal Swamp.
Shaffer, J. M.	Fairfield, Iowa	Groundhog-skin, bird-skins, &c.
Shaw, A. H.	Austin, Texas	Seeds or berries of *Sophora affinis*.
Smithsonian Institution	Washington, D. C.	Silk-cotton from South America; insects from Kansas, South America, and miscellaneous collections of insects; trout from New Hampshire; Indian foods, cotton, bombax; collections of Lieutenant Wheeler in entomology: woods, plants, and miscellaneous specimens.
Spencer, N. F.	New Market, N. C.	Peeler cotton.
Spicer, O. E. & C.	Parkersburgh, Iowa	Hull-less oats.
Taylor, Thomas A.	Fort Gibson, Indian Ter.	Collections of insects.
Tenney, E. B.	Walker River, Indian Reservation, Nev.	Fish-nets used by Pi-Utes.
Thomas, Cyrus	Washington, D. C.	Grasshoppers from Utah.
Thornton, R. S.	Montague, Mass.	Apples.
Thralls, George R.	Little River Vineyards, Fla.	Cotton.
Trenchard Commodore.	United States Navy	Fine specimen of pampa grass.
Webber, Mrs. F. P.	Marietta, Cobb Co., Ga.	Miscellaneous specimens of insects.
Wever M. B.	Johnson's Depot, S. C.	Trap-door spider and nest.
Whitaker, B.	Warsaw, Ill.	Galls and gall insects.
Williams, J. W.	Warnock, Ohio	Bently sweet-apples.

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